Urban Policy for Sustainable Development: Taking a Wide-Angle View

By Donald Alexander & Ray Tomalty

Planning for Sustainable Urban Development

By Ray Tomalty, Sue Hendler & Kim Flick

Issues in Urban Sustainability No. 6

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URBAN POLICY FOR SUSTAINABLE DEVELOPMENT: TAKING A WIDE-ANGLE VIEW
PLANNING FOR SUSTAINABLE URBAN DEVELOPMENT
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CONTENTS*

URBAN POLICY FOR SUSTAINABLE DEVELOPMENT: TAKING A WIDE-ANGLE VIEW
Donald Alexander and Ray Tomalty 1

INTRODUCTION 1

REVIEW OF THE EMPIRICAL LITERATURE 3
URBAN FORM 3
A. The costs of sprawl 4
B. Evidence in support of compact urban form 5
C. Evidence against compact urban form 8
D. Nodal development and new towns 10
POPULATION 12
A. Population growth 12
B. The importance of size questioned 13
REFLECTIONS ON THE EMPIRICAL LITERATURE 14

REVIEW OF THE VISIONARY LITERATURE 17
THE NATURAL LIMITS TO GROWTH 17
THE SOCIAL LIMITS TO GROWTH 22
REFLECTIONS ON THE VISIONARY LITERATURE 26

CONCLUSIONS 29
PRINCIPLES FOR URBAN POLICY FOR SUSTAINABLE DEVELOPMENT 29
GOALS FOR URBAN POLICY FOR SUSTAINABLE DEVELOPMENT 30
RETHINKING THE ROLE OF POLICY ANALYSIS 31

NOTES 32

REFERENCES 34

PLANNING FOR SUSTAINABLE URBAN DEVELOPMENT 43
Ray Tomalty, Sue Hendler and Kim Flick

INTRODUCTION 43

DEFINING SUSTAINABLE URBAN DEVELOPMENT 44

THE COMPACT CITY 47
CASE STUDY: KITCHENER, ONTARIO 51

THE HEALTHY CITY 52
CASE STUDY: KINGSTON, ONTARIO 56

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*The papers in this volume have been refereed under the IUS peer review mandate and are published in conjunction with the IUS refereed papers series.

THE GREEN CITY 57
CASE STUDY: SAN FRANCISCO 60

POTENTIAL FOR CONVERGENCE AND CONTRADICTION 61
COMPACT AND HEALTHY CITIES 61
COMPACT AND GREEN CITIES 64
GREEN AND HEALTHY CITIES 65

CONCLUSION 67

NOTES 68

REFERENCES 69

URBAN POLICY FOR SUSTAINABLE DEVELOPMENT: TAKING A WIDE-ANGLE VIEW

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> Differences in urban form and structure must be evaluated in terms of the set of human ends (or benefits) they will serve, the other ends foregone, and the differing means (or costs) required to achieve these benefits. Each of the alternatives is a package of goods favoring a particular set of values or life-styles and having a particular price tag attached. . . . The ends can be compared in relatively simple, concrete terms, such as housing choice, job accessibility, class and race patterns. But the deeper social and economic effects will be harder to assess: productive efficiency and individual opportunity; family welfare, privacy, security, and cosmopolitan stimulation; quality of communications, adaptability to further change, social relations, and responsible citizenship (Wurster, 1963, p. 79).

INTRODUCTION

The scope of urban policy for sustainable development depends on one's definition of sustainability. Formulating policy in the narrow sense of the term would involve seeking to minimize the environmental impacts of human settlements. A recognition of the multi-dimensional nature of sustainability would lead to attention being paid to the use of settlement policy to advance a variety of aims—ecological, economic, and social—or what Pearce (1992) has identified as three hallmarks of sustainable development: *survival*, *equity* and *welfare*.[1]

In this review of literature relevant to urban policy for sustainable development, we consider both empirical writings and more "visionary" work. The bulk of the empirical writing has been done in the last 25 years, whereas much of the visionary work is historical. However, as modern ecological thought in many cases draws direct inspiration from the visionary planners and urbanists of the past, some of the writings we consult in the visionary section are also contemporary.

There are a number of aspects of urban policy for sustainable development that could be considered: environmental policy, impact assessment, urban forest and wildlife management, waste management, soil remediation, transportation policy, social policy and municipal purchasing policies. However, we have chosen to focus on the built environment as providing the "glue" that links the other aspects together, that sets the overall context. Richard Register (1993, p. 4) has coined the term "ecocity insight" to capture the importance of the built environment for sustainability:

> Everywhere the environmentalist, conscientious architect and caring citizen come up against apparent contradictions. But if we look at the structure of cities, towns and villages, and realize that they can be built on ecological principles, the contradictions may be reconciled. That insight, though—that the structure of the built habitat is the foundation of environmental and social success or failure—is almost completely missing from the current debate. I call it the ecological city insight, or most simply, the ecocity

> insight. In all my wanderings from Australia to South America, North America to Europe, I practically never hear it mentioned.

Along similar lines, E.P. Fowler (1991, p. 26) notes that

> [w]hen local officials talk about what they are doing to support the environment, they point to recycling programs, tree plantings and banning chlorofluorocarbons. And while such policies are significant, they ignore the basic patterns of land use which must be changed before our cities can be ecologically sensible settlements.

Whereas the visionary literature tends to focus broadly on the impacts of the built environment on human culture, the empirical literature focuses more narrowly on the problem of environmental and fiscal efficiency.[2] Conceived narrowly or broadly, the implications for sustainability of the built environment are considerable.

The built environment is analogous to the role of technology in resource development: its qualities largely determine the efficiency with which materials are used, how much waste is generated, and how much mitigating environmental management is required. The nature of the built environment is thus the natural target of public policy intervention, and this fact is reflected in the place it occupies in the current literature on sustainable urban development (Breheny, 1992a).

Although market forces play a major role in determining urban form, they do so in a given public policy context. The domination of our cities by the private automobile, and the infrastructure associated with it—expressways, parking lots, strip malls, and auto-oriented suburbs—is a product of incremental and major public policy decisions that have included massive expenditure to subsidize the private automobile. The under-development of mass transit in many areas, the prevalence of single-use zoning, the policy of allowing vegetation to be stripped off in new developments, and the culverting of streams are all manifestations of the dominant role played by public policy decisions.

The environmental impacts of human settlements can be conceived of as a product of total population times *per capita* impact (Hardin, 1991). Catton (1985, p. 75) has noted that humanity is a species "prosthetically equipped by cultural evolution to magnify with technology the *per capita* requirements and the impact of each passing generation upon its surroundings." In cities, as in rural areas, the mediating technology is largely comprised of the built environment and associated infrastructure. That North Americans consume approximately 60 times as much energy *per capita* as East Indians (Catton, 1985) is related to our mode of transportation, the energy intensiveness of our physical infrastructure and the types of lifestyles conducted within its compass. As the world's population becomes progressively more urbanized, it is increasingly urban form and infrastructure which determine the aggregate impacts that humanity has on its environment, a fact which is only now beginning to receive the attention it deserves (Register, 1993).

Over the last one hundred years, Canada's urban population has increased almost ten-fold, from less than two million to 19.4 million. Over this time, and especially in the last forty years, two major settlement tendencies have emerged: a greater proportion of people are living in urban regions, but these regions are becoming progressively less concentrated on the urban centre.

The two aspects, then, that will be considered in our review of urban policy for sustainability are *population size* and the *built environment*. In considering population, we treat people as both *biological* and *cultural* beings. As biological beings, humans consume resources and produce wastes, and their activities have a potentially detrimental impact on biodiversity and life-support systems. As cultural beings, humans are capable of developing ecologically sensitive consciousness and of transforming the institutions and structures that govern their day-to-day activities and their relationships to nature. In terms of the built environment, we will consider the nature of urban regions in terms of density and structure.

In considering the issues raised by both empirical and the visionary literatures, we arrive at five broad goals or areas of concern which we feel urban policy for sustainable development should address, or at least be mindful of. These include: the maintenance of *ecological integrity*; achieving the *cultural preconditions for sustainability*; fostering the *livability/equality* of the built environment, reducing *environmental impacts and resource use,* and maximizing the *fiscal efficiency of urban form/infrastructure*. The first two are given greater stress in the visionary literature, the third is covered by both literatures, and the last two are more strongly emphasized in empirical writings.

REVIEW OF THE EMPIRICAL LITERATURE

In this section, we explore some of the current empirical literature on sustainable urban development from the point of view of the themes identified above, i.e., urban form and population.

URBAN FORM

Since at least the Second World War, a substantial literature has grown up on the fiscal and environmental efficiency of various urban forms. The debate to be found in this literature is largely structured by the notions of the compact versus the sprawled city.

A. The costs of sprawl

Urban sprawl may be defined as the incremental, haphazard expansion of the urban envelope at low densities. Without producing a complete catalogue of the relevant issues, we provide a few examples of the empirical literature on the effects of urban sprawl in the Canadian context.

- *Land consumption:* Some 60 percent of Canada's housing stock is made up of single-family detached dwelling units. Since these dwellings are usually incorporated into development patterns which are much less dense than those normally associated with other housing forms, they typically require much more land to accommodate any given population. For example, at an average of 45 persons per net hectare, single-family detached homes normally house some 58 percent fewer people per net hectare than rowhouses (at an average of 108 persons per net hectare); approximately 71 percent fewer people than walk-up apartments (at an average of 156 persons per net hectare); and anywhere from 76 percent to 97 percent fewer people per net hectare than high-density, multi-family housing. In all, residential land uses (predominantly suburban) consume over 50 percent of the total area of typical Canadian cities. Along with the miles of roads necessitated by the auto-oriented shopping malls they tend to encourage, our living arrangements easily account for over 70 percent of land-use shares in Canadian cities (D'Amour, 1991).
- *Energy consumption:* According to Sanderson and Wolfe (1978), Canada has the highest *per capita* use of energy in the world. The heavy demand for fuels is attributable not so much to the cold climate as to the form of Canadian cities—the way they spread over the landscape. Half the energy used by the average urban household is used for driving cars. Sweden, with a comparable living standard, uses only three-fifths as much energy per person. The National Energy Board (1986) estimates that operating the existing stock of housing accounts for over 20 percent of the nation's total energy demand, a figure that does not include the extra embodied energy associated with single-detached houses, which require up to four times more infrastructure per unit than duplexes (D'Amour 1991).
- *Destruction of habitat and farmland:* Because cities were often originally located so as to exploit an agricultural hinterland, urban deconcentration tends to consume high-quality agricultural land. Thus Warren *et al.* (1989) have found that in the 20 years of urban growth from 1966 to 1986, large Canadian cities spread chiefly onto agricultural land: of the 301,440 hectares of rural land urbanized, 58 percent was of high agricultural capability.
- *Groundwater pollution:* The deconcentration of urban populations has given rise to an extensive urban-rural fringe based on septic systems. In Ontario alone, there are now close

to one million septic systems installed, many of them in poor condition. Health officials estimate that 30 percent of septics in Ontario are failing, contaminating drinking water and exposing the public to health hazards (Silversides, 1991).

- *Stormwater runoff:* Urbanized areas are generally covered by hard surfaces that inhibit the percolation of rainwater into the soil. Instead, runoff is directed into the storm sewer system and usually discharged untreated into the receiving body of water. Such water is a major source of toxic metals, chlorinated organic compounds, and other serious pollutants (Environment Canada, 1991).
- *Wetland destruction:* Wetland areas in the vicinity of major cities have been greatly reduced as a result of urban growth. Since 1950, wetlands have been steadily dredged, drained, and filled for port, industrial and airport use, waste disposal and urban growth in general. By 1981, up to 98 percent of the wetlands in the Regina, Winnipeg, and Windsor areas, 88 percent in the vicinity of Toronto and Montreal, and nearly 78 percent in the Vancouver, Calgary and St. Catherine's-Niagara Falls areas had been converted to other uses (Environment Canada, 1991).

B. Evidence in support of compact urban form

In order to respond to the perceived disadvantages of urban sprawl, many authors have prescribed a more compact urban form. Researchers in this field have identified several compact urban forms. The compact city may refer to the pattern of settlement on a regional or sub-regional scale. At the regional level, Preston (1977), for instance, identifies two optimal forms: "multiple centres" and "radial corridors." Likewise, Rickaby (1987) has explored inter-urban forms from an energy point of view and recommends "centralization" into a compact high density city or "decentralized concentration" with separate concentrated sub-centres around existing large cities.

At the sub-regional or intra-urban level, Owens (1986) suggests two more compact forms: an "archipelago" pattern, made up of self-sufficient urban sub-units of about 10,000 to 30,000 people, and "linear grid" structure focusing development on a small number of routes, a pattern that would encourage public transport and communal heat and power systems with the "holes" in the grid allowing the use of solar energy.

A key determinant of the environmental sustainability of a given urban form is the amount of car usage associated with it. Automobiles are responsible for over 40 percent of all air pollution (Brown and Jacobson, 1987). Downing and Gustely (1977) found that air pollution from automobiles was 20-30 percent less in a more compact planned community than in an unplanned sprawled

development. Given the contribution of private transportation to global warming and acid rain, this is clearly an issue of *global* as well as local and regional significance.

It has been argued that a compact urban form reduces the need for motorized transportation. Passenger transportation energy can be reduced in two ways: by making cars more efficient, and by making urban structures more efficient. Goldstein *et al.* (1990) argue that both approaches are feasible, and present evidence showing that each could realistically produce a 30 percent or greater reduction in transportation energy consumption over the next 30 years. Holtzclas (1991) compares vehicle miles travelled *per capita* and per household for San Francisco, Chicago, New York, London, Toronto and elsewhere. The results show a consistent pattern: doubling residential or population density reduces the annual auto mileage on a *per capita* or per household basis by 20-30 percent.

A widely-cited study by Newman and Kenworthy (1989) on transportation and density in 32 world cities shows the direct relationship between density, viability of public transit systems, and automotive fuel usage. Along the same lines, Goldstein *et al.* (1990) conclude that areas that are built to high density will not function effectively without transit service, and will provide an excellent market for the establishment of such service. Pucher (1988) compared urban transportation systems and travel behaviour in 12 Western European and North American countries. He found that the success of public transportation depends more on supportive urban development and automobile taxation policies than on transit subsidies.

Many researchers have also argued that higher densities enhance the potential for walking and cycling. Patterson (1992), for instance, looked at eight Canadian cities and compared place of residence, place of work, and mode of transport to work. He concluded that higher densities and greater proximity of home and work are required if the choice of mode of travel is to become more healthy or environmentally friendly.

Other environmental claims of the compact city concern the efficiency of resource use. First, there is some evidence to support the claim that smaller living units and multiple dwellings are more efficient in terms of energy and materials use. Owens (1986) found that heat energy is more than 20 percent more efficient in semi-detached houses and nearly 30 percent more efficient in rowhouses than in comparably insulated single-family dwellings. A mid-floor apartment requires about one-third the heat energy of a detached house of equivalent size. She also argued that high density makes district heating feasible. In another study, Downing and Gustely (1977) found that in high-density areas, energy consumption from auto transport, space heating and cooling requirements was more than 40 percent lower than in low-density residential developments. Water consumption was reduced by approximately 35 percent in high-density communities. A 1985 study in Sault Ste. Marie found that

semi-detached and townhouse units consume an average of 66,400 MJ/unit annually, and that apartments consume 33,200 MJ/unit annually. These figures were 20 percent and 60 percent less respectively than detached units, which consumed 83,000 MJ/unit annually (Lang, 1985).

More densely settled cities may also allow for more efficient heating systems. D'Amour (1993) has drawn attention to the potential for higher density areas to use cogeneration and district heating. Both are highly efficient in the delivery of space heating to households, a use which accounts for 67 percent of all residential energy consumption. He cites a detailed study in the U.K., which suggested that minimum housing densities of about 44 units per hectare are required before cogeneration and district heating can be a viable alternative. The average density of much of Canada's single-family housing is only 10-15 units per hectare. Thus, these possibilities remain largely untapped in Canada.

It is often argued that compact cities reduce energy and materials used in the provision of infrastructure and utilities. Rybczynski (1991), who co-developed the "Grow Home" concept, has pointed out that a modest one-storey single-family house typically needs a 60 foot wide lot—i.e. each house requires 60 feet of roadway, sewer/water line and storm sewer. A narrower, two-storey cottage can be built on a 40 foot wide lot, reducing these needs by a third. A semi-detached house requires only 30 feet of frontage and correspondingly less infrastructure. Row houses, which can be built on 20 foot wide lots, reduce infrastructure needs by two thirds. A study conducted by the Ontario Ministry of Municipal Affairs (1982) found that higher density designs made it possible to save more than 40 percent of the energy involved in creating hard services that would typically go into a conventional design.

These infrastructural issues also have significant impacts on the fiscal sustainability of community design. Fiscal arguments focus on whether high- or low-density neighbourhoods and communities are more expensive to build from a public point of view. Studies in this area tend to be of three kinds: engineering studies of hypothetical settlement patterns; those that concentrate on a specific urban area and analyze various development scenarios; and those that depend on statistical analysis comparing several urban regions. In general, studies relying on engineering estimates and hypothetical development scenarios have tended to find a *per capita* reduction in public expenditures as population densities increase.

In the mid-1950s, the Lower Mainland Regional Planning Board (1956) in British Columbia conducted one of the first Canadian studies on the costs of servicing low-density development. Based on an analysis of utility and servicing costs (road paving, road and ditch maintenance and water supply costs) of three zones representing different population densities in the Surrey area, the Board concluded these costs to be significantly higher in lower density areas than in higher density areas.

In the U.S., Wheaton and Schussheim (1955) analyzed the impacts on municipal costs of density, size of settlements and location of hypothetical developments to accommodate additional residential growth in three Massachusetts cities. The authors found that service costs of water supply, sanitary sewers and streets tend to decrease as density of residential population increases. This was attributed to a reduction in length of streets and utility lines per dwelling. These conclusions were reinforced by Isard and Coughlin (1956) in a similar study of hypothetical settlements.

The Real Estate Research Corporation's (1974) publication *The Cost of Sprawl* is the best known study using engineering estimates. The study examined the costs of various development patterns for six communities and six neighbourhoods with a range of population densities. The study included capital and operating costs of utilities, including sewers, water supply, storm drainage, utilities and soft services including police, fire and schools. The authors found that planned, more compact development is less costly than unplanned, sprawled development. In 1977, Downing and Gustely used the RERC data to study variation in public costs for different housing types. They found that capital costs for single-family housing were substantially greater than for high-rise apartments, especially for water supply, storm drainage and sanitary sewers.

C. Evidence against compact urban form

Not all studies on the fiscal implications of urban form favour more compact cities. Statistical studies tend to show that higher population densities are associated with higher *per capita* local government expenditures. One of the earliest statistical studies on local government service costs was conducted by Brazer (1959), who analyzed data for 462 cities having over 25,000 inhabitants in 1950. Except for highways and recreation, he obtained a positive correlation between *per capita* local government expenditures and population density. Another study by Bahl (1969) examined city expenditures for 198 central cities with populations over 50,000. He found population density to have a positive and significant influence on *per capita* expenditures with the only exceptions being highway and park expenditures. In 1967, Kain examined the relationship between urban form and the costs of urban services by analyzing and evaluating existing studies on the subject. He concluded that: (1) there is a weak dependency between the costs of urban services and density, and that development-standards appear to be more important in determining outlays for urban services; (2) any savings in urban service costs for high-density structures are often offset by higher construction costs.

The fiscal arguments in favour of the compact city are not the only ones to be contradicted by other research. For instance Altshuler (1977) has claimed that the energy benefits of a higher density urban form are exaggerated. He criticized the Real Estate Research Corporation study (mentioned

above), charging that it overestimated the environmental impacts and energy consumption levels of low-density communities.

Another pillar of the compact city argument, the study by Newman and Kenworthy mentioned above, has also been attacked. Gordon and Richardson (1989), for instance, claim that the variation in fuel consumption among cities of different densities may reflect differences in lifestyle and travel behaviour. They conclude that Newman and Kenworthy's "analysis is faulty, that the problems are wrongly diagnosed, and that their policy and planning prescriptions are inappropriate and infeasible" (p. 342).

Doubt has also been cast on the land efficiency of compact cities. Troy (1992) argues that proponents of intensification exaggerate the amount of land used for residential development and the potential land savings to be gained from intensification. In Australia, for instance, the actual average lot size for new development is about 700 square metres, only two-thirds the size repeatedly claimed by intensification proponents. Because less than half of urban land is typically used for residential purposes, implausible increases in residential density would be necessary to achieve even modest savings in land and infrastructure demands.

Even the claim that compact cities will help preserve the farm economy have come under attack. Richardson (1991) has pointed out that physical urban expansion eliminates only a small proportion of the stock of good agricultural land, and thus that the difference made by intensification in this respect would be negligible. Moreover, the concentration of population in compact cities may, ironically, serve to undermine the rural farm economy by depriving farmers of economic activity that could have sustained them—i.e., the right to sever and sell parcels of their land. At least two authors have argued this case as it applies to urban containment policies in Britain (Newby, 1990; Breheny, 1992b).

Other researchers have marshalled evidence to show that compact cities would themselves produce serious environmental problems. Naroff and Ostro (1982) have argued that high-density, core-oriented cities have higher levels of mobile and stationary-source pollutants than dispersed cities. The authors present the results of a model devised to determine the degree to which the concentration and dispersion of jobs and population would change the level of pollution in the central city. Results suggest that the population dispersal from 1960 to 1970 was associated with a 2.0 percent reduction in nitrous oxides and a 0.5 percent reduction in pollution concentration. Likewise, the U.S. Department of Housing and Urban Development (1980) found that low-density, dispersed development patterns, separating residential areas from sources of pollution, attain better urban air quality than do mixed-use patterns.

High-density urban areas tend to be congested, and slow-moving traffic causes high fuel consumption. La Barra and Rickaby (1987) have shown that fuel consumption at 15 km/hour—the average speed in central London—is about 30-40 percent higher than at suburban speeds of 40 km/hr. Moreover, a compact city form may interfere with the exploitation of renewable energy sources (Ward, 1990). Most renewable forms of energy—including solar energy, wind and tidal power—can best be utilized in small packets in a dispersed settlement form.

D. Nodal development and new towns

Clearly, there is no consensus over the environmental costs and benefits of the compact city. This lack of consensus in the research literature fuels the political debate about desirable urban forms in concrete planning situations, where decisions have to be made about the distribution of expected population growth in metropolitan areas. Some municipalities compete with neighbouring jurisdictions for new residents in the belief that it will increase the municipal tax base, or they attempt to turn away new residents in the belief that intensification of the urban fabric will be opposed by voters. The expected location of new population growth also has important repercussions in terms of financial transfers from senior governments and regional infrastructural investment decisions (Tomalty, forthcoming). In some regions, such as Toronto and Vancouver, a political compromise has been reached between those advocating more compact cities and those preferring fewer restrictions on urban growth—what is often called the "nodal development" option (OGTA, 1991; GVRD, 1993).

Nodal growth is conceived of as a middle policy option between forcing new growth into the already built up areas and uncontrolled sprawl. Centres of growth throughout the region are chosen to receive the new population entering the urban-regional system. Infill of vacant or underused lots in the already built up areas in each node is encouraged, as are higher densities and mixed land uses in any new development.

From an environmental point of view, a nodal urban form may combine the strong points of more centralized compact cities and lower density settlements. For instance, the evidence showing that higher density cities are more fuel efficient generally assumes a monocentric model of urban development, whereby trip lengths increase as urban growth extends from the centre. Gordon and Wong (1985) counter this model with a polycentric model, which states that trip-ends (especially for work trips) become more dispersed as cities grow and that this development is in many ways economical. To test for this, the authors used a national sample from the U.S. 1977 Nationwide Personal Transportation Study. They conclude that dispersed work trip-ends have allowed for shorter work-trip distances for suburban residents in the largest cities. In a later paper, Gordon and Richardson

(1989) argue that as urban growth continues, the monocentric city becomes inefficient due to increasing congestion costs in the core, and that as a result, a polycentric urban structure emerges. They found that dispersed and polycentric metropolitan areas facilitate shorter commuting times.

A nodal growth policy may involve the creation of new towns, such as Seaton in the Toronto area or Bamberton outside Victoria. As distinct from the traditional suburb on the urban fringe, these new towns are being planned in the spirit of garden cities, in that there is an emphasis on environmental design principles, a variety of land uses and the provision of local employment opportunities to reduce commuting to the urban core.

Key to the sustainability of new towns is the degree to which they are independent from existing urban centres. On the one hand, if they are relatively self-contained with an appropriate mix of residential and employment opportunities, new towns have the potential to avoid some of the environmental pitfalls of large, densely settled cities. On the other hand, if they evolve into auto-dependent bedroom communities, then they will merely reinforce the problems associated with urban sprawl.

Empirical evidence on the sustainability of new towns is sparse. One of the earliest studies on this question was carried out in the U.K. by the Barlow Commission, which recommended the creation of new towns around London in the immediate post-war period. Besides looking at public health, housing, traffic congestion, and property values, the Commissioners studied journey to work patterns. While using less than rigorous scientific methods, they concluded that, on the whole, new towns would involve less commuting and traffic congestion than adding an equivalent population to the already densely settled London area (Hall, 1989).

Building on the earlier work of Cresswell and Thomas (1972), Breheny (1991) found that the independence of new towns has fallen steadily since 1966 to the point where they show no more evidence of being self-contained than other towns. However, new towns still had advantages over other towns in that the larger ones did show more independence than ordinary towns of similar size, and new towns of any size that were relatively isolated showed high degrees of self-containment.

There are also fiscal implications in the choice between establishing new towns or incrementally adding population to existing urban areas. Empirical evidence on city size and the cost of service delivery seems to favour the creation of new towns over the growth of existing towns beyond an optimum point. There is a simple economic explanation for this observation: as a city grows, it is able to take advantage of economies of scale in the provision or services (such as garbage collection, water and sewerage, roadways, policing, education, *etc.*), but after a threshold point, costs begin to increase because of inefficient bureaucracies and worker alienation. After their review of

studies on this topic, Kushner (1992) conclude that "there appears to be a consensus that scale economies are exhausted when a municipality reaches a population size of 250,000." Where a municipality is part of an metropolitan system, scale economies may be exhausted at even smaller population sizes.

It is worth noting, however, that some researchers have presented evidence contradicting these general findings. Kitchen (1976), for instance, has found that for garbage collection, exactly the reverse relationship between city size and cost holds; i.e., costs increased up to a population of 324,000 and then began to fall. Elsewhere, Richardson (1977) has argued that large cities can accept growth without increased servicing costs by decentralizing into smaller service-provision units.

POPULATION

This consideration of new towns leads us into a discussion about the importance of population levels in determining the sustainability of various urban forms. In the debate over sustainable settlement patterns, city size has diminished in importance for two reasons. First, many observers have become resigned to population change as an exogenous variable controlled by federal immigration policy, the large-scale movements of capital around the continent, free trade, and demographic and lifestyle changes. Second, others have argued that size itself is not an important variable in sustainability. We look at each of these arguments in turn.

A. Population growth

Attempts to apply direct controls to city population growth have fallen into disfavour (e.g., Bourne, 1975). Except under the most authoritarian conditions—such as in Cambodia, Vietnam, China and Cuba—where city size has been controlled through forced migration, food rationing and rigid birth control measures, the growth of cities has proven to be beyond the reach of public policy. The inability of the city of Moscow to control population growth, even with rigid controls on immigration to the city, is often cited as an exemplar of the ineffectuality of population control policies (Lynch, 1984).

Attempts to limit city growth through land-use controls have met a similar fate. In the 1970s, the limits to growth debate (see also the second half of this paper) was translated into planning terms through the availability of a range of instruments known as growth controls. In the face of exponential increases in population and development activity—accompanied by the environmental and social consequences of such growth—many municipalities, especially in the U.S., began to search for and implement local policies designed to prevent or dampen further growth. Population caps, housing unit caps, and commercial development caps were established in some communities and enforced through

exclusionary land-use controls such as large lot zoning and minimum building sizes (Finkler and Peterson, 1974).

These attempts at local population control have been criticized on two principal grounds—that they didn't work, and that they were elitist. A good example of research that has brought the efficacy of growth controls into question is that of Landis (1992, p. 503):

> Little is known about how local growth controls affect local or regional environmental quality. It is often assumed . . . that properly administered local growth controls can help communities preserve open space, save natural habitats, and reduce certain types of pollution. Are such presumptions valid?

After reviewing growth control policies at the municipal level in California, Landis concludes that, "[v]iewed over a ten-year period, local growth control programs, of the types adopted in seven mid-sized California cities during the early 1980s, have been largely irrelevant to the management of urban growth." He notes that locally administered population and housing growth caps have proven extremely porous and that local growth control programs have had only a limited effect on local housing markets.

B. The importance of size questioned

Not only has the attempt to control population size diminished in importance as an achievable policy goal, some analysts have argued that size is simply not a significant determinant of urban sustainability. In an early essay touching on this topic, Bourne (1975, p. 19) argued that

> there is little evidence in the urban growth literature that the size of a city is strongly correlated with any of our major policy problems, at least not on a statistically consistent basis. There are large cities in Canada which are ugly, polluted, congested, costly-to-live-in and saddled with serious social problems. There are also small cities with the same problems (attributes), or with others equally serious. The origin of these urban problems lies elsewhere—in social inequalities, inadequate income and tax policies, limited imagination in urban design, governmental inertia, the lack of pollution controls, and in social attitudes. Such problems should be tackled directly, not indirectly through limits on city size.

Lynch appears to be more ambivalent than Bourne on this point, but ultimately he agrees that city size may not be an important determinant of good city form. For instance, he notes that arguments for optimum size are based on its effects on social intercourse, on political and social control, on the vitality of the environment because of accumulated pollution, on tolerable levels of social and perceptual stimulus, on travel time, on economic production, and on the costs of maintaining cities of different sizes (Lynch, 1984, p. 241).

He concludes, however, that

> while there are acres of such literature, it is very thinly sown with evidence. . . . In summary, there is evidence that some types of air pollution are positively correlated with city size, and that so is the travel time to work. Otherwise, most quantifiable factors show no correlation, or at least their connection is doubtful (ibid.).

Most of the effects we commonly associate with city size, he believes, may in fact be attributed to the density of the urban population and urban form. Even congestion, the one measure correlated with city size, "need not appear in extensive, multinucleate cities of low density, even if they are extremely large" (ibid., p. 242).

REFLECTIONS ON THE EMPIRICAL LITERATURE

The empirical literature draws the greatest attention to urban densities and structure as a key variable in determining the sustainability of urban areas. However, our review of the empirical literature on urban form reveals that opinions on the subject are highly polarized. Evidence is marshalled on both sides of the debate to support opposing policy prescriptions.

Those in favour of a more compact urban form claim that it will enhance the environmental and economic efficiency of the built environment and therefore should be supported through policy measures to restrict sprawl and preserve farmland on the city edge, encourage public transit over car use, and promote mixed over segregated uses of land.

Those opposed to high density cities tend to favour market forces over policy prescriptions in achieving optimal urban forms. They present evidence to suggest that policies to curb sprawl will be counterproductive because they will go against the forces leading to more efficient "edge cities," that the environmental benefits of the compact city are exaggerated by their proponents, and that compact cities have their own environmental problems.

The literature provides ample ammunition to support both sides of this debate, a debate which perhaps reflects larger ideological questions about the nature and purpose of cities, the definition of the good life, the appropriate relationship between humanity and nature, and the role of planning versus the market in determining the appropriate uses of land (Isin and Tomalty, 1993).

Clearly, there is a wealth of empirical literature on the environmental and fiscal efficiency of urban form. What Sadler (1990) had defined as the third dimension of sustainability—social welfare and equity—has received less attention in the literature on urban form. What empirical research there is tends to focus on two issues: the distributional effects of public policies designed to affect urban form and the desirability of various housing types.[3]

Equity has arisen as an issue in this debate because policies designed to promote a more compact urban form may have differential effects on various social groups. For instance, a

development freeze on the urban fringe may reduce housing affordability; the environmental benefits of a compact city policy (such as the preservation of ravine systems in certain neighbourhoods) may go primarily to those wealthy enough to capture the benefits for their personal use; or the economic costs of a compact city policy (say, the loss of construction jobs) may fall more heavily on one sector of society than others (van Vliet, 1991).

Some compact city policies may result in regressive social policy. For instance, impact fees are commonly levied on new developments in order to help finance environmental services. Most forms of such fees unfairly tax poorer home owners. Fees based on the unit value of the housing being constructed are regressive because poor people spend larger proportion of their income on housing than the rich (Nicholas 1992). A related issue concerns the effect of intensification policies on the segregation of social groups. In the Toronto context, for instance, Bourne (1991, p. 198) has observed that intensification of the core area has lead to "an inner area landscape in which residential spaces are even more polarized between rich and poor, private and public."

The other social issue that receives attention in the literature on urban form concerns the quality of life that can be expected in various urban settings and the desirability of housing types. Higher density living usually implies a greater diversity or mix of land uses, integrating residential with non-residential functions such as retail, recreation, commercial and even industrial uses. A study conducted by Baum *et al.* (1978), based on interviews with residents in medium-density areas, found that proximity to non-residential land uses increased people's dissatisfaction with their environment. On the other hand, in his study of 19 neighbourhoods in Toronto, Fowler (1991) has found the less the overall small-scale physical diversity—no matter what the economic makeup of the neighbourhood—the less neighbours knew each other, and the more crime there was.

Several researchers have found that many people are averse to the housing conditions found in higher-density central cities: traffic congestion, the relatively unsafe conditions typical of inner cities (Kivell, 1993), dislike of ethnic and racial diversity, aversion to high-density living, antipathy towards interaction with dissimilar social groups (Audirac, 1990), and the desire to avoid proximity to non-residential land uses (Baum *et al.*, 1978). Other researchers have pointed to the factors attracting people to suburban areas: a pleasant environment for raising a family, privacy (Lansing *et al.*, 1970), and a rural ambiance (Fuguitt and Zuiches, 1975). Thus, policies promoting the compact city may overlook the clear housing preferences of most consumers for low-density single family housing (Code, 1992).

However, other researchers, who have focused on the policy and institutional factors that cause the dispersal of cities, put the issue in a different light. They have drawn attention to the ways

in which we provide incentives for people to choose low-density suburban areas as a by-product of other policies: for instance, the public provision of transportation and communication infrastructure (Vining, 1979), and public subsidies for car use (Hanson 1992), and larger homes (Nelson, 1992). This view is reinforced by Jackson (1985, p. 293) in his historical study of suburbanization in the U.S.: "Suburbanization was not an historical inevitability created by geography, technology, and culture, but rather the product of government policies."

Neuman (1991) has taken this line of thought the furthest. He has presented evidence that sprawl says less about the urban forms people desire and more about what they are offered by the development industry and planning professionals. He makes the interesting distinction between the housing-type preference, which he admits is overwhelmingly single-family, and the preferred form of community: "While Americans may prefer single family homes, this does not mean they want them to exist in sprawling forms" (p. 346). He goes on to cite evidence showing that community residents, when shown images of both sprawl and traditional housing and community types, prefer traditional types anywhere from four to one to eighty to one. He writes:

> [I]t is my view that people have not had a choice in a supply-driven market. Most new construction has assumed this form, for primarily expedient economic and political reasons, despite our druthers. The mass-producing industrial economy has translated the American dream of the single family home the only way it could—into large-scale suburban sprawl. Thus, the myth, and mistake, of sprawl has been encoded into everyday practices, etched in everyman's psyche (p. 346).

This position, if adopted, would justify a full-scale re-examination of the social forces and policies leading to urban sprawl and would justify strong policy intervention in reshaping the planning and development system. Although intellectually attractive, this position raises a number of important questions not well addressed by the empirical literature: if we are going collectively to choose a sustainable urban form, what are the implications of that choice for access to services, for the quality of community life, the willingness of citizens to participate in a vibrant and meaningful democratic life, and the burden communities place on regional and global ecological systems? Neuman (1991, pp. 344-45) goes on to point out that:

> [t]he debate is not about sprawling versus compact form, high versus low density, or environmental protection versus economic development. These polarities cast the issue in a simple way that glosses over the complexity of life today.

Instead, he suggests that we pose a different question: "How does growth contribute to the community it is in?" We turn now to a review of the visionary literature, in which this question is of central significance.

REVIEW OF THE VISIONARY LITERATURE

Although the discussion of sustainable urban development and related policy matters is only a few years old, it seems largely uninformed by a long history of debate that has borne directly on the question of desirable settlement patterns. Because these historic literatures have, to some degree, grappled with the major value questions alluded to by Wurster in the introductory quotation, we feel it would be a contribution to review these and synthesize lessons and insights for more contemporary discussions of urban policy. This will be dealt with under the headings of *natural limits to growth* and *social limits to growth*.

THE NATURAL LIMITS TO GROWTH

The notion of limits to growth is closely connected to the concept of carrying capacity; consequently, we will review these concepts together.

The first author in the English-speaking world to address the issue of limits to growth was Thomas Malthus (1798/1960). He developed the famous argument that human population would inevitably outstrip food production. He believed that the former progressed geometrically while the latter developed arithmetically. In the short term, Malthus was proven wrong. In particular, he underestimated the potential for agricultural innovation, failed to take into account the growth of the global trade in agricultural products, and did not foresee the "demographic transition" which would lead to a state of near-zero natural population growth in many developed countries (Wrigley, 1973; Berry *et al.*, 1992). Malthus's views were bitterly attacked by Marx and other nineteenth century social critics (see Meek, 1971).

Another early author whose writings developed an analysis of the impact of humans on their environment and foreshadowed the limits to growth/carrying capacity debate was George Marsh. Marsh's book, *Man and Nature: Physical Geography as Modified by Human Action*, was first published in 1864. He developed a sophisticated analysis of the relationship between environmental factors such as tree and vegetation cover, soil quality and recharge, and showed how deforestation could have potentially devastating impacts on the productivity of the land and its capacity to support human life (Guha, 1991). Another pioneer, Stanley Jevons, published *The Coal Question* in 1865. According to Jevons, the limiting resource for industrial society was not food but coal. All other available energy resources were inferior. Countries such as Great Britain would one day run out of coal, and would be forced into a state of reduced productivity and declining prosperity (Paehlke, 1989).

Related to the notion of limits to growth is the concept of carrying capacity, which was originally developed in the context of range management and population ecology (Lynch, 1984). It

referred to the number of animals a given piece of land could support without being overgrazed and thereby destroyed. One of the first authors to apply the concept systematically to human beings was William Vogt (1948, p. 16), who described carrying capacity as involving "the resultant of the ratio between. . . . biotic potential . . . [and] environmental resistance"—environmental resistance consisting of various constraints, such as climate, pests or human-induced degradation of soil resources that might limit land's potential productivity.

Vogt implicitly acknowledged that the concept had a subjective dimension, since he spoke of the land's ability to support what he called a "civilized existence" as opposed to mere subsistence. He also recognized that technology could be used to reduce limiting factors of environmental resistance, and that it could also have the opposite effect.

A contemporary of Vogt's, Fairfield Osborn, echoed many of the themes of Vogt in his own book, *Our Plundered Planet* (1948). Reviving the concerns of Malthus regarding the relation of population to food supply, in light of the worldwide decline in the death rate, he extended this resource shortage critique to include minerals, chemicals, and petroleum, and argued that "[m]an . . . must temper his demands and use and conserve the natural living resources of the earth in a manner that alone can provide for the continuation of civilization" (1948, p. 201). In essence, Osborn was calling for a form of sustainable development 40 years before the Brundtland Commission report (1987). His 1953 book, *The Limits of the Earth*, suggested that "the goal of humanitarianism is not the quantity but the quality of living" (p. 226).

In the same year as the latter book, Samuel Ordway published *Resources and the American Dream*. Though the idea was obviously in the air, Ordway first used the phrase, "limit[s] to growth," suggesting that if the industrial practice of drawing down resources were to continue, "basic resources would come into such short supply that rising costs would make their use in additional production unprofitable, industrial expansion would cease, and we shall have reached the limit of growth. If this limit is reached unexpectedly, irreparable injury will have been done to the social order" (1953, pp. 31-32).

The discussion of deleterious impacts of human activity on the environment and the potential for ecological catastrophe continued through the '50s and '60s with an international scientific symposium, published under the title of *Man's Role in Changing the Face of the Earth* (Thomas, 1956), and with a spate of books published in the early 1960s by Rachel Carson, Barry Commoner and Murray Bookchin.

Thereafter, the environmental literature mushroomed, but the book, *The Limits to Growth*, commissioned by the Club of Rome and authored by Donella Meadows and associates (1972), was the

first to put the issue of "limits to growth" clearly in the public consciousness and on the public policy agenda.

As had Malthus and Osborn—and their contemporary, Paul Ehrlich of "population bomb" fame—Meadows *et al.* focused on the role that food supply and a scarcity of non-renewable resources could play in limiting human growth. However, they expanded their analysis to include the impacts of human activities on the ecosphere's ability to absorb wastes. Their principal conclusions were that

> [i]f the present growth trends in world population, industrialization, pollution, food production, and resource depletion continue unchanged, the limits to growth on this planet will be reached sometime within the next one hundred years . . . (Meadows *et al.*, 1972, p. 29).

However, it was their opinion that it was possible

> to alter these growth trends and to establish a condition of ecological and economic stability far into the future. . . . If the world's people decide to strive for this . . . outcome . . . , the sooner they begin working to attain it, the greater will be their chances of success (ibid.).

In retrospect, their 1972 projections regarding non-renewable resources—particularly, minerals—were overstated. The authors tended to treat the supply of these minerals as absolute. They failed to see that available reserves are dependent on price, substitutability, and the state of existing technology (Knox and Agnew, 1989; Berry *et al.*, 1992). Because of their abundance in the earth's crust, mineral resources, with the exception of fossil fuels, are not likely to run out in the near future. However, the general principle that there are limits to demographic and economic growth, and that the carrying capacity of the ecosphere is in danger of being exceeded, is the germane point, regardless of specific predictions.[4]

Over the years, there has been a shift in emphasis from looking at carrying capacity and limits to growth in terms of resources to giving more emphasis to waste assimilation and life support systems. In the late '60s and early '70s, this was mainly expressed in terms of damage to local and regional ecosystems. But, increasingly over the last decade, attention has come to be focused on impacts occurring at a global scale—the thinning of the ozone layer, the exacerbation of the greenhouse effect, and the catastrophic decline in biodiversity.

In an important article published in 1985, William Catton noted that, in the past, human beings have extended the carrying capacity of their environments by means of technological breakthroughs that enabled them to *take over* resources from other species and increase their population. Since approximately 1800, this has been combined with *drawdown*—the rapid extraction of non-renewable resources such as oil—which has led to a drastic, but very temporary, increase in global carrying capacity.[5]

There are limitations to the discussion of carrying capacity reviewed so far. It does not deal with global trade and resource flows, and it does not address in detail *quality* of life, rather than mere subsistence. In recognition of the fact that humans today—particularly in "developed" countries—draw their sustenance from all over the globe, Rees and Wackernagel (1992) have developed the concept of the "ecological footprint," or what they also call *appropriated* carrying capacity.

Human beings today are no longer constrained by the carrying capacity of their own regions, as animals are, nor by the effects of their overconsumption in an immediate sense, because they are able to import additional—though not necessarily surplus—carrying capacity from other regions (Rees, 1988). The potential for regions, particularly those which are developed, to live beyond their means has contrived to produce a global crisis of carrying capacity that is affecting some groups in society more than others. The damage done to the ecosystems and economies of the South by developed nations' consumption patterns has been extensively documented by Shiva (1992), Adams and Solomon (1991) and Timberlake (1987), among others.[6]

Because the impacts of different human populations are not confined to their immediate regions, Rees and Wackernagel (1992) have created productive land area equivalents to express the *per capita* consumption and waste production rates of residents of various regions. In a truly equitable world, each resident of the planet would be entitled to use the bounty of 1.7 ha of productive land, of which .3 ha would be food-producing.[7] Thus, in a world where each urban region sought to live within its carrying capacity, rather than draining off carrying capacity from other regions, it would be entitled to an area equivalent to its population times 1.7 ha of productive land as a resource, life support and waste assimilation hinterland.[8] Of course, this assumes that human beings have "first dibs" on the resources of the planet.

The other major revision in recent years is the theoretical effort undertaken by Godschalk and Parker in 1975, who distinguished three kinds of carrying capacity—*ecological*, *perceptual*, and *institutional*. With respect to the first kind, they suggest three levels of carrying capacity which differ "by the amount of environmental change that is considered acceptable in a particular situation" (Godschalk and Parker, 1975, p. 161). These range from preserving natural areas in a pristine state, without disturbance, to maintaining a particular level of quality in an environment—as in a city, where nature has already been modified—to preventing the complete collapse of an ecosystem.[9]

A second type, *perceptual* carrying capacity, relates to the amount of degradation that an environment can sustain before it ceases to possess the level of "quality" desired by its residents, and is thus closely related to the concept of livability.

Institutional carrying capacity is defined as the ability of organizations in an area to guide development towards public goals. It involves the limitations imposed by governmental structure, budgets, and personnel as well as the more general economic and cultural limits of the area as they relate to the assimilation of growth (Godschalk and Parker, 1975, p. 163).

This dimension of carrying capacity might include the limits of existing transportation or water and sewer infrastructure, the willingness or ability of taxpayers to support more expenditures, or the ability of planners to cope with the demands of development applications while still retaining a pro-active, longer-term focus. It could even be extended to "softer" services, such as health care, education, police and fire protection, and social services (see Alexander and Sells, 1990).

In attempting to draw programmatic direction for policy work, Rees (1988, p. 30) has argued that "[a]n understanding of carrying capacity provides a functional definition of sustainable development" and a conceptual basis for measuring the impact of human activities on nature. The concept of carrying capacity has been applied to urban and regional planning with varying degrees of success (see Bishop *et al.*, 1974, and Schneider *et al.*, 1978) and continues to fall in and out of fashion.

Some have suggested that urban or regional sustainability is inherently problematic because of the character of urban regions as "open systems" (Nijkamp *et al.*, 1992, p. 42). Others have argued that if the residents of regions could learn to become more self-reliant and live within their respective carrying capacities, no ecological crisis would exist at a global scale; the global crisis is the cumulative product of regions living beyond their means (Rees, 1988; Alexander, 1989).

While it is beyond the scope of this paper to go into detail on this point, it suggests the possible utility of defining appropriate regions within which cities could "internalize" and sustain their ecological demands. Current urban planning regions, at least in Canada, are rarely larger than commutersheds. These are not large enough to maintain biotic diversity and other aspects of life support, nor provide for resource use and waste assimilation.

While urban regions may never become completely self-sufficient, to move in that direction would require the establishment of planning regions whose size could be guided by Rees and Wackernagel's appropriated carrying capacity ratios. Somewhere between the Canadian requirement and the global *per capita* requirements for a productive land base would be needed as the city's larger ecological "domain." Without the identification of such regions, the concept of "sustainable cities" runs the risk of becoming an oxymoron since, in practice, cities almost inevitably exceed the carrying capacity of local ecosystems (Owens, 1992).

THE SOCIAL LIMITS TO GROWTH

In our discussion of population, and its relation to limits to growth/carrying capacity, we have focused largely on the impacts of people as biological beings on their environment. But much of the visionary literature is also concerned with how settlement patterns and population size can affect people as cultural beings. In the final section of our review of the visionary literature, we will discuss qualities of settlements that are conducive to dialogue and personal participation in decision-making, retaining a sense of community and identity, and a sense of "obligate dependency" on natural processes and cycles.

The proper size and density for cities from the vantage point of the three criteria mentioned above has been the subject of discussion since ancient times. Aristotle suggested a limit of "the largest number which suffices for the purposes of life, and [which] can be taken in at a single view" (quoted in Sale, 1980, p. 192). This has variously been estimated as being between 30,000 and 50,000 people.

The Greek city-states were the first to practice a form of democracy, albeit one that excluded women, slaves, and foreigners. The Greek notion of democracy emphasized direct participation and eschewed political professionals. To know the measure of one's fellow citizens and thereby avoid demagoguery, it was felt necessary that people should know and be able to interact with all members of the polis (Bookchin, 1973). This necessarily demanded a certain restricted size.

Outside of indigenous societies, democracy slumbered until it made its reappearance in the medieval free cities of Europe. These, and the communities that would inspire the artistic and scientific achievements of the Renaissance and the democratic theories of the Enlightenment, were generally comprised of no more than 50,000 people (Sale, 1980).

With the Industrial Revolution, urban population size and density exploded. This, in turn, generated a reaction in the form of the modern town planning movement whose early proponents were horrified by the congestion, pollution, unsanitary conditions and lack of amenity that characterized many modern European and North American cities (Weaver, 1984).

One of the first and most insightful pioneers in this revolution, Ebenezer Howard, developed the concept of the garden city in his book, *Garden Cities of To-Morrow* (1898/1966). Howard's proposals were motivated by his perception that both city and countryside were being degraded by then-current patterns of development. Rural areas were being depopulated and lacked the social and cultural attractions of the city, and cities were crowded, polluted, and unhealthy (Buder, 1990).

Howard hoped to combine the best of both worlds in his garden communities of approximately 30,000 people, which would be self-sufficient in employment and would grow much of their own food

on their perimeters. Such cities would be linked to each other by means of orbital transportation systems, and would be arrayed around a central metropolis in an overall regional network. Such cities were not suburbs, but industrial towns, planned in such a way as to preserve the health of their inhabitants. Their land would be held communally though municipal corporations; green belts would limit their expansion (Weaver, 1984).

Benton MacKaye, of the Regional Plan Association of America (RPAA), was another thinker in the visionary tradition to offer opinions and prescriptions related to city size and density. MacKaye's main preoccupation was not with cities *per se*, but with urban regions as a whole. MacKaye (1928/1962) divided regions into three distinct environments—wilderness ("primeval"), countryside ("rural"), and urban ("communal"). In MacKaye's view, all three environments "seem to form, when normally developed, a complete and rounded external world adapted to man's psychologic needs" (quoted in Hiss, 1990, pp. 189-90).

MacKaye felt that the integrity and uniqueness of these environments was being negatively affected by metropolitan sprawl: "These souls live all in a single environment: not city, not country, but wilderness—the wilderness not of an integrated, ordered nature, but of standard disordered civilization . . . " (quoted in Hiss, 1990, p. 189).

His solution was to conceptualize a "regional city" of approximately 30 by 40 miles, where the integrity of each environment would be protected by a park and expressway system limiting development—using green belts and roadless areas to buffer wilderness and countryside. Implied in these solutions was the notion that an urban area would not exceed a certain physical size, and that future demographic growth would result in higher densities. MacKaye saw cultural and quality of life advantages residing in each of the three environments, and felt their differentiation should be protected from what he called "formless" metropolitan sprawl.

A frequent collaborator of MacKaye's was the prominent urbanist and planner, Lewis Mumford. Mumford wrote a number of books about cities and regions, but his landmark work was *The Culture of Cities*, originally published in 1938. In it, he writes:

> What is important is not an absolute figure as to population or area. . . . What is more important is to express size always as a function of the social relationships to be served. There is an optimum numerical size, beyond which each further increment of inhabitants creates difficulties out of all proportion to the benefits. There is also an optimum area of expansion, beyond which further urban growth tends to paralyze rather than to further social relationships (1970, pp. 487-88).

Mumford envisaged a multinucleated city structure in which each city would be relatively self-sufficient, while also specializing in certain functions that could be accessed through a regional transportation system. He wrote:

> Twenty such cities, in a region whose environment and whose resources were adequately planned, would have all the benefits of a metropolis that held a million people, without its ponderous disabilities: its capital frozen into unprofitable utilities, and its land values congealed at levels that stand in the way of effective adaptation to new needs (1938, p. 489).

Ten years later, Paul and Percival Goodman published their famous book, *Communitas* (1947), which they issued again in revised form in 1960. In it, they rehearsed a variety of city proposals and "paradigms." Their own favoured option was for relatively self-sufficient regions based on diversified agriculture, which would necessitate cities of no more than 200,000 people. They also argued that space in large North American cities is badly used and that living conditions could be extremely amenable, even with 200 persons to the acre. This thinking lead them to suggest that a city of four and half million could readily be contained within a circle with a radius of five miles, beyond which would commence gardens worked by the inhabitants and open forest land (Goodman and Goodman, 1960).

While they expressed certain preferences, they were quite catholic about the range of possible city types. They were somewhat disparaging of the garden city concept, noting with distaste the separation of work and work spaces from home life, and suggested that the suburban preoccupations of actual garden cities are such that, "rather than live in a Garden City, an intellectual would rather meet a bear in the woods" (1960, p. 35).

A year after the second edition of *Communitas*, Jane Jacobs published her landmark work, *The Death and Life of Great American Cities* (1961). She challenged the conventional wisdom of city planners and was unequivocal in her condemnation of the "garden city" concept, and the sanitary low-density suburbs and single-use city centres which she felt it had helped spawn.

Jacobs argued for mixed-use, close-grained neighbourhoods, the preservation of existing building stock, and anything that facilitated an active, sociable street life in place of the "projects" and "urban renewal" favoured by many planners. Few books have had as explosive an effect in the field of urban planning as hers.

Also relevant is the work of Murray Bookchin, a writer heavily influenced, like the Goodmans, by anarchist social thought. Although he has been accused of being a ruralist, in fact his position is that "[o]nly in a complete urban environment can there be complete people; only in a rational urban situation can the human spirit advance its most vital cultural and social traditions" (1973, p. 2).

As with Mumford, Bookchin has expressed a belief in the concept of urban thresholds:

> Just as there is a point beyond which a village becomes a city, so there is a point beyond which the city negates itself, churning up a human condition that is more atomizing—and culturally or socially more desiccated—than anything attributed to rural life (1973, pp. 2-3).

As early as 1965, Bookchin was arguing for the decentralization of cities into what he called "eco-communities." This was necessary if renewable energy was to become the basis of human settlement; if a citizenry capable of participating in all facets of production and decision-making was to be fostered, and if people were to be in touch with natural rhythms and cycles.

With respect to renewable energy, Bookchin wrote in the late 1960s that

> [t]o maintain a large city requires immense quantities of coal and petroleum. By contrast, solar energy, wind power and tidal energy reach us in small packets. It is hard to believe we will ever be able to design solar collectors that can furnish us with the immense blocks of electric power produced by a giant steam plant; it is equally difficult to conceive of a battery of wind turbines that will provide us with enough electricity to illuminate Manhattan Island. If homes and factories are heavily concentrated, devices for using clean sources of energy will probably remain mere playthings; but if urban communities are reduced in size and widely spread over the land, there is no reason why these devices cannot be combined to provide us with all the amenities of an industrial civilisation (quoted in Ward, 1990, p. 330).

On the issue of optimizing participation, Bookchin (1987, p. 60) expressed the opinion that communities require a "variety of public spaces in which citizens [can] gather on more intimate terms, often daily, to discuss public and practical affairs."[10]

In terms of reconnecting with nature, he wrote in 1965 that

> [t]o bring the sun, the wind, the earth, indeed the whole world of life, back into technology, into the means of human survival, would be a revolutionary renewal of man's ties to nature. To restore this dependence in a way that evoked a sense of regional uniqueness in each community—a sense not only of generalized dependence but of dependence on a specific region with distinctive qualities of its own—would give this renewal a truly ecological character (Bookchin, 1971, pp. 129-30).

To summarize briefly, three themes emerge from the visionary literature and reappear in the ecological critique of society it partly inspired (Hill, 1985). These are the importance of creating settlements that foster democratic participation, that are conducive to a sense of community, and that facilitate ecological responsibility. These are themes that the empirical literature has overlooked, especially the relationship of these attributes to the built environment.

We believe a strong case can be made for considering these elements to be preconditions for sustainability, even though the authors who originally posed them did not use that terminology. Many sociologists and critical commentators have written about the alienation, powerlessness and sense

of anomie that have accompanied modern urbanization (Gibson, 1975). Though one can argue that they are not its inevitable concomitants, these characteristics are certainly inimical to the achievement of sustainability. People who do not care about, or feel they cannot influence, the conduct of public affairs are not capable of working for a sustainable future. This is also true of those who have little or no sense of community—no notion of a "common good" beyond private interests—nor an engagement with nature going further than cellophaned wrapped meat, garbage cans and flush toilets. Clearly, a transition to a sustainable society is not possible without reconnecting people to a sense of their own active citizenship, to their communities, and to the natural environment that sustains them.

Nearly 30 years ago, Murray Bookchin wrote,

> a balanced community, a face-to-face democracy, a humanistic technology and a decentralized society . . . are not only desirable, they are also necessary. . . . they . . . constitute the *preconditions for human survival* [emphasis added] (Bookchin, 1971, p. 69).

Since the mid-'60s, when Bookchin first wrote these lines, there have been numerous ecological writers who have directly, or in passing, dealt with issues of urban size and density. Paehlke (1986) cites as examples Eugene and Howard Odum, Donella Meadows, William Ophuls, Amory Lovins, E.F. Schumacher and Theodore Roszak. To these could be added the authors of *Blueprint for Survival*, published in 1972, and alternative economist James Robertson (1978). According to Paehlke, there has been a general fondness among these writers for the "bucolic," and he claims that "there have been few within the environmental movement who have envisioned a future more urbanist than the present" (1986, p. 2).

Paehlke's brief monograph (1986) was one of the first writings by an environmentalist to challenge this preference for decentralization. It presaged the blossoming of literature on sustainable urban development, with many writers advocating larger, more densely organized cities.

REFLECTIONS ON THE VISIONARY LITERATURE

Our discussion of the empirical literature reviewed a number of considerations relating to settlement: size, density, and regional and local structure. While it was not possible to single out the treatment of these strands in the visionary literature, we can offer a few observations.

The arguments reviewed above relating to size suggest that *scale* is an important parameter for fostering human solidarity and participation. This has led many visionary authors to advocate smaller, relatively low-density settlements. However, some have suggested that large cities themselves are not problematic so long as viable neighbourhoods exist (Lynch, 1984). If neighbourhoods have declined in recent years, this may have less to do with city size than with

changes in lifestyle and jobs—attributes that may be influenced by transportation infrastructure, separation of land uses, and a shift in the location of employment.

With regard to density, some feel that higher densities can be positively correlated with participation and a sense of community (Jacobs, 1961). Others feel that extreme density—such as that found in high-rise apartment complexes—breeds isolation, anonymity, privatism, and a feeling of domination by the built environment (Fowler, 1991). Still others feel that nature and green space can be integrated into high-density environments with minimal loss of amenity (Goodman and Goodman, 1960). In general, the bias of the visionary literature is towards relatively low density, with Mumford and MacKaye being somewhat exceptional in this regard. This preference is expressed in Patrick Geddes's words: "I have to remind all concerned . . . first that the essential need of a house and family is *room*, and secondly that the essential improvement of a house and family is *more room*" (quoted in Ward, 1990, p. 330).

In order to avoid extreme city size and densities, a number of the authors cited favoured the notion of a "regional city" of multinucleated settlements in which communities of relatively equal size are arrayed in some connected pattern, with some specialization of function (Mumford, 1970), or a "solar system" pattern of a central city surrounded by "satellites" (Howard, 1966).[11] Some authors, such as Howard—and, to a lesser extent, Mumford—advocated the separation of functions at a local level, while others (Jacobs) favoured mixing functions to promote livability and a sense of communal responsibility.

In all of this writing—and in more recent material by Gratz (1989) and Alexander *et al.* (1975)—there are tantalizing clues as to what constitutes optimum urban form. However, until this material is better analyzed and synthesized, no single model unequivocally recommends itself; there is a plurality of potential models. In light of this, and given some of the excellent empirical work that has been done to date, a modest research agenda might focus on some of the following topics:

- Both urban population *control* and spatial growth *management* programs have been attempted. Some of the latter, such as the Oregon Comprehensive Planning Law (Steiner, 1991), have been relatively successful and their lessons need to be learned and their potential applicability studied. At the same time, while currently outside the scope of the powers available to municipalities and regional governments, the issue of population control must one day be confronted. Bill Rees (1991, p. 466) notes that population within a region can "increase without violating carrying capacity . . . if average material standards [are] lowered or if the efficiency of resource use or waste management [is] improved." However, given that we have

already exceeded the carrying capacity of the planet, this is an option that will soon encounter "diminishing marginal returns."

- Kevin Lynch (1984) has pointed out that optimal densities, from a fiscal and social point of view, depend to some degree on the cultural context. Nonetheless, he suggests that row housing and relatively low-rise walk-ups may be the most efficient types of housing from an overall cost standpoint. More research is needed on optimal social densities and land-use mixtures from the standpoint of the "social limits to growth," and a better sense is required of the social acceptability of the medium-density housing just described.
- Most of the nodal city options that have been explored in Canada—for instance, the "town centre" approach embraced in the Vancouver region—is predicated on having "nodes" of high density in an overall sea of low density more or less continuous urban development. The feasibility of "new towns," with fixed transit links and green belt separation, might be revisited and the lessons of new town development in other contexts explored more thoroughly.
- The feasibility of deploying renewable energy and organic waste treatment systems in relatively denser urban contexts needs further exploration (for initial research in this area, see Owen, 1992).
- We know the contributions that cities make to modern civilization, but we know too little about what rural settlements contribute, and what is lost when rural settlements decline. Too often we treat the growth of major cities and the atrophy of rural communities as a "given." However, little attention has been paid to the potential for using incentives to encourage people to settle in areas which are ecologically not very productive and are at the same time rapidly depopulating—for instance, rural Saskatchewan.

To conclude our review, it can be said that the visionary literature is often written in the spirit of social criticism and utopian speculation, rather than the empirically-oriented research which now prevails in academic and policy circles. Perhaps the challenge for contemporary urbanists is to attempt to marry these two traditions—to retain the breadth and the humanistic concerns of the visionaries, while striving for more empirically viable propositions and greater theoretical rigor (Hill, 1985). To some degree, Kevin Lynch has attempted to do this in his book *Good City Form* (1984), and his work needs to be extended from a sustainability perspective.

CONCLUSIONS

PRINCIPLES FOR URBAN POLICY FOR SUSTAINABLE DEVELOPMENT

Having looked at both empirical and visionary writings concerning population and the built environment, what can we learn that is relevant for future urban policy for sustainable development? In our view, there are a number of points that should inform future research.

1. **There are limits to human economic and demographic growth, even if it is not always possible to define them with precision.**

As Godschalk and Parker's (1975) work implies, these limits may exist less in the form of absolute barriers than as a series of thresholds which presage various qualitative changes in environmental quality.

The concept of carrying capacity is one tool which can be used to identify such limits. Moreover, a carrying capacity framework needs to be expanded to encompass the aggregate effects of population and consumption in a given region, which can then be compared with that population's "allotment" of productive land. While we didn't have space to reprise Rees' (1988) analysis of inter-regional trade, it supports the suggestion that regions should seek to fulfil their needs from within the carrying capacity of their own regions, and only export what is truly surplus. This suggests the necessity of defining the appropriate urban region within which to achieve a balance regarding sustainable resource use, waste assimilation and life support.

2. **In the long-term interests of sustainability, we need to protect and restore the ecological integrity of biophysical systems.**

Much of current urban policy for sustainable development would seem to be ameliorative in nature—seeking to minimize the impacts of seemingly inevitable development. Given the lack of control that municipalities have over many of the variables concerning growth, this is certainly understandable, but such policies should not be considered optimal. Many cities—for instance, Los Angeles, which draws its supply of water from hundreds of miles away—have already exceeded their regional carrying capacities (Jaakson, 1977). Nor is it clear that further intensification will be able to offset the effects of future population growth.

The opportunities for dealing with the larger issue of maintaining or achieving ecological integrity, rather than merely slowing the rate of degradation, would seem to lie in two directions. One option is to disperse populations and to modify human activities so that aggregate levels of resource use and waste production can be accommodated by local ecosystems. The other is to continue to concentrate populations in relatively dense cities and to develop policies to achieve the sustainability

of human activities in regions sufficiently large to enable settlements to "internalize" their ecological demands.

3. A sustainable society is indivisible.

Policy measures to achieve a more ecologically efficient urban form and function cannot be separated from economics, politics, and culture—from the values and institutions which shape urban form and which in turn are shaped by it. All must change together in the transition to a sustainable society.[12] Breheny (1991, p. 22) has written that

> the issue [of urban form] is complex and needs careful analysis and extensive debate . . . We must be wary of assumptions that there can be a direct relationship between changes in urban form and environmental improvement. The forces that determine energy consumption, urban change and environmental degradation are complex. They are political, social and economic, as well as physical.

This uncertainty, and the complexity of the cause-effect relationships involved, suggests that rather than seeking "technofix" solutions, we should be striving to build a society that possesses an ecological sensibility at its very core, and which will be able to apply its collective wisdom to the problem of achieving optimum urban form.

GOALS FOR URBAN POLICY FOR SUSTAINABLE DEVELOPMENT

Taking these principles into account we suggest that, in considering urban policy for sustainable development, there are five broad (possibly conflicting) goals that policy analysts need to be aware of. These go beyond merely rearranging the existing built environment. Specifically, we feel that policies for sustainable urban development should:

1. contribute to the maintenance or realization of ecological integrity;
2. promote the cultural and political prerequisites for the achievement of sustainability—namely, opportunities for participation in deliberation and decision-making, a sense of community, and a sensitivity to our "obligate dependency" on nature;
3. enable "economies of scale" to be achieved for the provision of environmentally beneficial infrastructural systems;[13]
4. reduce environmental impacts and resource use; and
5. facilitate the maintenance or enhancement of "livability" or quality of life.

On this latter point, it should be stressed that it will be difficult to "sell" urban policies for sustainable development which result in changes in the built environment if these are perceived as *reducing* quality of life. Also, as a variety of commentators have emphasized (Paehlke, 1989), sustainable development cannot be made to occur at the expense of the poor and disadvantaged, as

this will produce a backlash and lead to heightened social conflict. Sustainable development will only proceed to the extent that the conflicting demands for ecological *survival*, *equity*, and *welfare* are harmonized and achieved in a relatively simultaneous fashion. While outside the scope of this review, attention needs to be devoted to locating case studies where these outcomes have occurred, to derive appropriate theoretical and practical guidance.

RETHINKING THE ROLE OF POLICY ANALYSIS

On balance, we can say that the visionary literature has tended to be more normative and speculative, while the contemporary literature is more rigorous, pragmatic and seeks relatively incremental changes. Both approaches have merit. A radical change in settlement patterns, and in accompanying political and economic systems, is likely to encounter sharp resistance from powerful interest groups and from a general public conditioned by dominant cultural values. At the same time, current urban systems are clearly unsustainable and will not become significantly more sustainable through tinkering with existing densities unless other changes occur as well.

Perhaps policy analysts need to focus on both short-term ameliorative measures and on a longer-term rethinking of urban structures, and use their research to help stimulate the public debate which is a necessary concomitant to achieving it. Robert Paehlke's comments are relevant here:

> Policy analysis is not, as some would have it, simply a matter of evaluating available sets of policy options. Policy analysis must be a more creative process than that; it must be at least as much an art as a science and must incorporate consideration of the evolution of ideas; reflections on the values that are, or might someday be, held by the citizenry at large; and careful consideration of feasibility, prudence, likelihood, and desirability. Most policy analysts reasonably distinguish themselves from those who quickly leap from the "is" to the "ought," or vice versa. But it does not follow that policy analysis should or can avoid normative matters. . . . Some of the [academic] fraternity need to play the fool, to take a chance in exploring riskier, wider, value-laden issues [than is currently occurring] (1989, pp. 274-75, 218).

NOTES

1. Pearce (1992) suggests that trade-offs may need to be made between these.

2. This is a generalization. Another way of putting this distinction is to contrast the "normative (or ethical) dimensions" of urbanism with the "functional (or explanatory)" aspects (Hill, 1985, p. 407).

3. For more on the relationship between compact urban form and social equity, see Tomalty, Hendler and Flick (this volume).

4. The literature we have focused on so far tended to ignore urban issues, which gives it a certain commonality with early writings on sustainable development. As Tomalty (1993, p. 3) writes, "[t]he early literature on sustainable development focused on non-urban systems and on resource issues in particular." This neglect is ironic in light of the fact that "[c]ities are where most resources are transformed into finished products and consumed"; they are also "the prime locus for the generation of waste and other pollutants that impact non-urban areas" (ibid.). Fortunately, this oversight is beginning to be corrected.

5. Not only is the carbon released into the atmosphere through this process threatening to disrupt global climate, but the increased exploitation of renewable resources has reached a point where it is estimated that humans are now appropriating more than 40 percent of terrestrial Net Primary Production, or biomass, for themselves (Vitousek *et al.*, 1986). If current increases in the rates of consumption continue, this would rise to 100 percent in a few more decades, which is clearly an impossibility (Daly and Cobb, 1989).

6. For a discussion of the same pattern of exploitation in regards to First Nations' peoples and lands, see Churchill (1992).

7. This amount will obviously shrink as population grows and as resource lands become degraded and/or converted to urban uses.

8. As noted earlier, the concept of carrying capacity has expanded over the years to encompass not only resource consumption, but also waste assimilation and maintenance of life support systems. Rees and Wackernagel's land units take into consideration resource drawdown and waste assimilation for CO_2, but neglect biodiversity issues. For a more detailed description of their methodology, see Rees and Wackernagel (1992).

9. Of course, one has to define the area within which environmental parameters will be measured. Parts of a city can be ecologically dead while existing within the context of an overall healthy region.

10. The Goodmans (1960, p. 49) make a related point: "A city is made by the social congregation of people, for business and pleasure and ceremony. . . . Without such squares—markets, cathedral-places, political forums—planned more or less as inclosures, there is no city."

11. For more recent work in this vein, see Gertler and Crowley (1977) and Preston (1977).

12. Blowers (1992, pp. 34-36) argues for the following preconditions for achieving sustainable urban development: "*the nation-state [must] surrender power upwards to supranational authorities and . . . devolve powers to regional and local authorities*"; "*environmentally damaging operations of multinational corporations [must] be prevented by effective national and international controls*"; "*planning within a participative democratic political system must be introduced at all levels to coordinate and enforce the conservation of resources and the control of pollution,*" and "*resources must be redistributed to give priority to environmental conservation*" (emphasis in original).

13. This goal is increasingly germane in light of the fiscal constraints being experienced by urban communities.

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PLANNING FOR SUSTAINABLE URBAN DEVELOPMENT

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INTRODUCTION

The concept of applying sustainable development to an urban context has been slow to catch on in Canada and elsewhere—whether it be with planners and policy makers or the broader environmental movement. The early literature on sustainable development focused on non-urban systems and on resource issues in particular. Indeed, when the notion of sustainable development was first popularized by the 1981 World Conservation Strategy, its treatment of the concept completely by-passed urban areas (IUCN, 1980).

While the Brundtland report maintained the focus on resource issues, it also signalled the importance of applying the concept of sustainable development to urban issues by including a chapter on "The Urban Challenge" (WCED, 1987). However, this treatment was largely in the context of Third World mega-cities, and "though [the Report] made reference to urban phenomena in advanced industrialized countries, it did not provide the policy framework or conceptual tools necessary to relate sustainable development to practical urban policy making properly" (Wichern, 1990, p. 75).

At any rate, the response of Canadian governments to the Brundtland report, formulated by the Council of Resource and Environment Ministers, managed to avoid urban issues altogether (although the report boasted a nice picture of Toronto) (NTFEE, 1987). Likewise, the official response of the Canadian Environmental Advisory Committee to the Brundtland report made only passing reference to "the sustainability of the urban environment and of the urban economy" (CEAC, 1987, p. 56). Finally, the federal government's Green Plan (Government of Canada, 1990), inspired by the notion of sustainable development, focused on the traditional resource issues; cities were largely overlooked.

The preoccupation with the sustainability of resource development on the policy level was mirrored in the academic and professional literature. Much progress was made in applying the concept to forestry, agriculture, fishing, mining, and so on, but this work was of little help to those few researchers trying to understand how to make urban systems more sustainable. As Gariépy *et al.* (1990, p. 26) pointed out "it is undoubtedly more difficult to deal with the issue of ecological integrity when one is located in downtown Montreal than when one is in a tropical forest which is in the process of being fragmented."

Towards the end of the 1980s, some Canadian commentators had begun to remark on the need to adapt the concept of sustainable development to urban areas (e.g., Environment Council of Alberta, 1988). This was based on three general observations:

- In one of the most highly urbanized societies in the world, we could hardly achieve sustainable development without dealing with urban areas.
- Local government is largely responsible for the quality of everyday life and meeting our basic needs. It is often perceived to be the most responsive to citizen concern for the environment.
- Cities are where most resources are transformed into finished products and consumed. They are also the prime locus for the generation of waste and other pollutants that have impacts on non-urban areas. Therefore, a concern for sustainable resource use can not be divorced from urban issues.

In the last few years, the situation has changed considerably. Key initiatives have been undertaken at all levels of government, in universities and non-governmental organizations. At the national level, sustainable urban development initiatives include:

- a workshop on sustainable planning held by the Canadian Institute of Planners (CIP, 1990);
- a catalogue of sustainable urban development initiatives in large urban areas across Canada, published by the Intergovernmental Committee on Urban and Regional Research (Maclaren, 1992);
- research initiatives commissioned by the Canadian Environmental Assessment Research Council (Colnett, 1991) and the Federal Environmental Assessment Review Office (Davies, 1991);
- the CMHC's published research on sustainable development, housing, and community planning (D'Amour, 1991; 1993); and
- creation of an urban information project within Environment Canada's State of the Environment Reporting Office (Environment Canada, 1992).

So remarkable has been the growth in interest in sustainable urban development that by 1992, the compilers of a "select" bibliography on the subject could claim that although there were 400 items included therein, "by no means does it encompass the entirety of the relevant literature, which continues to grow apace" (Beavis and Patterson, 1992, p. iv).

DEFINING SUSTAINABLE URBAN DEVELOPMENT

Although the literature that has emerged on sustainable urban development is impressive, the concept has not achieved a fixed meaning or theoretical content (Maclaren, 1992). It is possible, however, to identify two broad approaches to the topic. Interpreting sustainable urban development as essentially an environmental protection policy applied to urban areas, the first approach would survey municipal programs and corporate operations that have a positive effect on the urban environment. Such an approach is oriented towards policies and programs that reduce the

consumption of resources and minimize the environmental impacts of development activities and city operations. Thus, this would include combating indoor air pollution, switching from gas to propane powered vehicles, changing building codes to reduce energy consumption in buildings, using salt substitutes on roads, planting trees in public parks, reducing the use of pesticides, purchasing recycled paper products, developing municipal composting programs, and so on.

This approach has been used in a number of nation-wide surveys of Sustainable Urban Development (SUD) (Maclaren, 1992; Ouellet, 1993; Tomalty, 1994); it is a catch-all approach that is appropriate for broad overviews of environmental performance in urban areas. There is, however, no attempt to relate environmental issues to other community issues such as social justice or economic development, or to integrate environmental protection into a theoretical model of urban development. The uni-dimensional nature of this approach has been criticized by Roseland (1992, p. 7):

> Environmental protection is like foam padding—it offers some protection from a fall. We congratulate ourselves if we double our spending to double the thickness of the foam, because we assume thicker foam means more protection. However, we only get more protection if we fall the same distance. Meanwhile, *unsustainable* development constantly increases the distance we're likely to fall. Sustainable development must therefore be more than merely "protecting" the environment: it requires economic and social change to *reduce the need for environmental protection*.

The second broad approach to characterizing SUD is alluded to in the above quotation; it is what we call the holistic-conceptual approach. While the details vary from analyst to analyst, it generally includes the following three dimensions:

- an ecological component, stressing the importance of environmentally sound policies and practices;
- economic aspects, including a concern with development activities and fiscal issues; and
- social equity issues, such as the fair distribution of resources and a concern for the distributive effects of environmental or economic policies.

A sustainable community is said to consist in the integration of the three dimensions: ecological, economic and social. This approach has been widely adopted in the literature on sustainable development (e.g., Sadler, 1988; Wismer, 1990; Nozick, 1992) and represents the closest thing to an analytical consensus on the term.

Because this approach encourages making connections among environmental issues and broader social and economic issues, it appeals to both academics who are looking for a conceptual framework to tie together the various "sustainability movements," and to community activists interested in building coalitions for more sustainable communities.

Unfortunately, this approach has several disadvantages. It lends itself to the tendency to present a "shopping list" of desirable community traits in each of the three dimensions of sustainability. The connections between environmental issues on the one hand and social and economic issues on the other hand go largely untheorized. Community goals are simply presented as a list of objectives or principles and little attention is paid to the necessary connections or potential conflict among such goals. Thus, the approach pre-empts a crucial dimension of community function—namely the politics of choosing among competing goals, of resolving conflicts, and the exercise of power. As Richardson puts it:

> the utility of the concept, both as an analytical tool and as a (potential) basis of policy, is eroded if sustainable development becomes an all-purpose "motherhood" rubric embracing every human, social, and environmental value. Such a broad perception of sustainable development would conflate what are really quite different kinds of issues needing to be addressed in quite different ways. In addition, such an inclusive approach would dangerously obscure the reality that strategies for addressing these issues can involve potential inconsistencies and even conflicts (as may arise, for example, with regard to housing policy) (Richardson, 1992, p. 147).

This holistic-conceptual treatment of SUD also suffers from being dissociated from what is actually happening on the ground. While the sustainable development ideal is complete integration among the three dimensions of sustainability, this has not been achieved in practice. Practical efforts towards urban sustainability are in fact taking place under a number of relatively independent movements, each emphasizing one or two dimensions of sustainability.

In this report, we accept that sustainability has three dimensions but avoid imposing an abstract unity on what is clearly a pluralistic movement. One reason why urban sustainability movements have evolved independently is that they are—at least partially—driven by different professional groups (and coalitions of professional groups) each with a distinct orientation to sustainability.[1] The notion of sustainability as applied to cities has gradually been absorbed by the professions involved in urban issues such as planning and urban design, architecture, engineering, public health, social planning and by those involved in the ecological sciences. Each of these professions approaches the topic of sustainability in a way that reflects their professional culture, orientation, mandate and goals.

How does this perspective improve our grasp of SUD over the conceptual package approach? First, it would not be surprising to find that each approach to sustainable urban development is actually a pre-existing reform movement that has been adapted for the new conditions with new jargon. Second, we can use this framework to contrast the assumptions and goals of the various sustainability movements into an objective perspective rather than interpreting their differences as a matter of

semantics, as is sometimes suggested. Third, rather than assuming a harmony of objectives, this framework will alert us to look for potential conflicts among the various goals of SUD.

Because our focus here is community planning, we survey three sustainability movements that involve professional planners. Each movement makes its own distinctive contribution to the vision of more sustainable cities. Each movement draws on a distinct tradition of reform within the planning profession, a tradition that makes alliances with other professional groups easier to attain. Finally, each movement emphasizes one of the three dimensions outlined above: economic stability is captured in the Compact City movement, drawing on the urban efficiency tradition in planning; social equity is emphasized in the Healthy City movement, being advocated by planners drawing on the public health tradition; and ecological integrity is expressed in the movement for a Green City, drawing on the traditions of landscape ecology and ecological site design.

Other movements might have been selected for the purpose of analysis in this review: community economic development, the safe city movement, the movement to integrate environmental assessment and land-use planning, the trend towards ecological health indicators and environmental reporting in urban areas, and so on. However, most of these movements do not combine—or attempt to combine—the three aspects of sustainable urban development (ecological, economic, social) that are addressed by the compact, healthy and green cities movements. Of the alternative movements listed, only the literature on community economic development is synthetic in this respect. It has not been selected for review here because CED relates more the tradition of economic planning rather than land-use planning practice at the local level, which is the focus of this review.

THE COMPACT CITY

In September of 1990, the Canadian Institute of Planners convened a workshop in Montréal to "discuss the implications of sustainable development for planning and for CIP itself" (CIP, 1990, p. 2). The workshop concluded that the concept of sustainable development "should be viewed as the intent and central operating principle of planning. An opportunity now exists for both planners and CIP as an organization to become leaders in the implementation of sustainable development principles, if action is taken quickly."

This workshop was significant in a number of ways. First, it was an acknowledgment that the planning profession had fallen behind the general public and other professions in adopting sustainable development as a guiding principle and signalled its intention to catch up in this respect. Second, it established the professional focus that planning would bring to the concept of sustainable development, namely the intersection between economic efficiency and environmental integrity. Other

issues would take a definite back seat to this overall concern: "The concept of sustainable development quite rightly places the environment/economy relationship centre stage." Regard would be given for social equity as a side-issue in implementing the primary mandate.

Such a focus on environment and economy was consistent with the notion of SD as developed by the Brundtland Commission and imported into Canada via the National Task Force on Environment and Economy. For instance, the WCED (1987) claimed that cities in industrialized countries are facing issues related primarily to the operation, maintenance and rehabilitation of urban services and infrastructures. MacNeil *et al.* (1991, p. 197) claimed that "the task involved in creating a sustainable city in industrialized countries can to a large extent be defined in terms of increased efficiency." Nigel Richardson (1992, pp. 147-48), himself a noted planning professional, observed that "Canada's National Task Force on Environment and Economy unequivocally took the position that sustainable development is only about the relationship suggested by the Task Force's name." Although he recognized that such an approach could be considered reductionist and simplistic, Richardson nonetheless adopted it for his own approach to SUD.

To return to the CIP workshop, we may note one further significance: it established that the built form of the city would serve as the main vehicle for achieving economic efficiency and environmental integrity. Although it was an obvious strategic choice given that development control is the source of the planning profession's social power, this was nonetheless a significant contribution to the notion of sustainable urban development.

According to this view, sustainable development implies a major shift in land use policy, not environmental policy. As Fowler (1991, p. 26) has remarked:

> the central role of local governments is the protection, servicing and regulation of property. When local officials talk about what they are doing to support the environment, they point to recycling programmes, tree plantings and banning chlorofluorocarbons. And while such policies are significant, they ignore the basic patterns of land use which must be changed before our cities can be ecologically sensible settlements.

Since the CIP workshop, the vision of a more compact, efficient urban form has become one of the chief paradigms of sustainable urban development. Indeed, many planning, policy and advocacy documents have proclaimed an "emerging consensus" that cities must pursue new patterns of development that will result in a more compact urban form. In Canada alone, the number of reports that have adopted this model is astonishing.[2] This "consensus" is composed of a three part package of interlinked concepts: a densely settled urban form; a mix of land uses; and a public transit system

to connect form and function. Lang and Armour (1982, p. 3) provide a typical vision of a more compact urban form:

> The settlement is compact. Little urban sprawl, strip development or underutilized land exist, the result of infilling and development controls. Nor does the settlement spread into its hinterland's agricultural areas and forests, which are seen as valuable energy resources.
>
> Places of work, residence, shopping and recreation are well related to each other and to the transportation system, and people choose to take advantage of them rather than making long automobile trips. Population densities in most parts of the community are sufficiently high to make transit feasible; it is also convenient, efficient and heavily used. Clustered along transit corridors and in the settlement's several centres are complexes that mix a wide range of activities for mutual advantage.

The compact city movement is composed of a broad range of allied organizations and interests: environmental advocates and professionals support the notion of the compact city because it implies the preservation of green space around and within built-up areas and because it is seen as reducing the need for auto-based travel; housing advocates and professionals appreciate its implications for increased housing choice and affordability; public transit advocates and professionals support it for the prominent role cast for mass transit, bicycle use and pedestrian access. Politically, the concept of the compact city tends to be supported by inner-city councils (and their staff), who are concerned about the loss of population and employment to suburban locations. However, this broad basis of support for the movement should not obscure its origins in the planning profession.

The notion of the efficient city has a long history in the annals of urban planning. Indeed, the efficiency of the urban system may go to the heart of the planning profession. In her book entitled *Dreaming the Rational City,* Christine Boyer makes the persuasive case that planning emerged in the early twentieth century with the mission "to impose disciplinary order over urban spatial development in order to transcend some of the barriers that thwarted economic prosperity . . ." (1983, p. 84). Such discipline was especially concerned with the patterns of vehicular movement, and the efficient use of urban space. In the first half of the century, increased efficiency meant reducing densities in the core, and building transportation links to the periphery, where most growth was directed.

Although the tendency for North American cities to sprawl was apparent before the Second World War, the post-war period witnessed a dramatic acceleration of this tendency (Vance, 1990). Richardson (1992, pp. 157-58) has identified three primary factors shaping the development of Canadian cities in this period: "rapid population growth during the automobile age, addiction to the detached house, and resistance to strong planning controls." Whatever the reasons, such sprawl was largely opposed by the planning profession as "uneconomical, wasteful, unaesthetic, and unplanned"

(Audirac *et al.*, 1990, p. 472). In fact, this concern with the economic and fiscal implications of urban sprawl has been so consistently maintained by planners that Morrill (1991) has called the compact city one of the central pillars of the "Mythical City" created by the planning profession.

The compact city, it is argued, will increase the efficiency of the urban system in a number of ways:

- optimizes the use of existing services and reduce the need for expensive new services such as sewage, water, recycling (Paehlke, 1989; Richardson, 1991);
- reduces auto-based travel and congestion and therefore the need for new investment in roadways (Goldstein *et al.*, 1990; Holtzclas, 1991);
- reduces energy and materials used for infrastructure and utilities (Real Estate Research Corporation, 1974; Rybczynski,1991; Ontario Municipal Affairs, 1982);
- enables more viable public transportation (Newman and Kenworthy, 1989); and
- maintains the economic viability of farmland in the urban hinterland (Warren *et al.*,1989).

The compact city is what Neuman (1991) calls a utopian vision. The strength of such visions is that "they portray, they compel, they inspire." On a more mundane level, a vision can only be implemented if the tools to do so are available. In this case, a large number of planning tools have been developed with the intent of promoting the more efficient use of urban space. Several works have reviewed these tools in various degrees of detail. For example, in an article by Rees and Roseland (1991), instruments are divided into two categories: transportation planning and traffic management initiatives; and land use planning and housing initiatives. Under the first category, they list the following instruments:

- trip reduction by-laws
- automobile restrictions
- road pricing
- parking measures
- free or inexpensive transit
- bicycle transportation
- street redesign and traffic calming
- telecommuting policies.

Under the second category, they list:

- proximity planning
- residential intensification
- co-housing
- community land trusts
- rural area protection
- co-management agreements.

Under the rubric of residential intensification, the Canadian Urban Institute (1991) has suggested the following five possibilities:

- infilling of vacant land
- site redevelopment
- suburban densification
- conversion of lower density residential to higher density residential
- adaptive reuse of existing non-residential stock.

In their book *Creating Successful Communities: A Guidebook to Growth Management Strategies,* Mantell *et al.* (1990) have suggested still other instruments available or currently in use, including:

- development charges
- agricultural land reserves
- urban limit lines
- minimum density requirements
- maximum lot sizes
- private land trusts
- cluster zoning
- transfer of development rights.

CASE STUDY: KITCHENER, ONTARIO

Writing about the situation in Australia, Troy (1992, p. 42) considers that the compact city "has its origins in the fiscal crisis of State and Federal governments." Undoubtedly, Ontario's prolonged, deep recession has created a fiscal crisis for both the provincial and local governments. Although the movement for more compact cities is certainly not new to the province, economic conditions have served to make the issue an urgent policy matter in the province.

The compact city is supported at the provincial level by several Ministries, including the Ministry of Housing and the Ministry of Municipal Affairs. In 1989, the Province of Ontario issued a housing policy statement under the Planning Act requiring municipalities to identify opportunities for intensification. The Ministry of Housing has also released its new policy on secondary apartments in existing houses, giving property owners the right to construct a second unit in their homes. Also recently released was the Ministry of Municipal Affairs' Growth and Settlement Guidelines, encouraging municipalities to pursue more compact settlement patterns. The province's Commission on Planning and Development Reform is also urging the province to amend its Planning Act so as to encourage a compact urban form.

The Regional Municipality of Waterloo, where the city of Kitchener is located in south-central Ontario, has adopted a sustainable development strategy in its official plan review. An important element of this strategy is the need for more compact cities, promoted by the region's Housing

Statement and official plan policies to direct growth, conserve farmland and encourage intensification. The draft Official Plan states that:

> The City of Kitchener promotes the concept of a compact urban form, the preservation of agricultural land and the efficient use of resources. The policies of this Plan will place emphasis on maximizing the use of existing serviced lands. In doing so, higher overall densities will be encouraged in developing areas of the municipality. Where appropriate, infill development and intensification of land and buildings suitable for residential use will be encouraged. Further, subject to the provision of adequate servicing and infrastructure, infilling and intensification of residential, commercial and industrial areas will also be encouraged (City of Kitchener, 1991, pp. 1-6).

New directions in the Official Plan have been set out through the development of Inner City Secondary Plans, which establish land-use policies on a neighbourhood-by-neighbourhood basis. These plans now incorporate a designation called "Low Density Conservation," which is specifically intended to allow existing single detached houses to be converted to duplexes or triplexes, while conserving the existing stock.

In 1991, the Housing Division of the Department of Planning and Development published a report entitled "Housing Intensification," designed to help the city develop an intensification strategy in response to the Ministry of Housing Policy Statement on Land Use Planning for Housing. This report examined the potential for residential intensification in Kitchener, including both small and large scale intensification projects.

To date, the City has built fourteen infill housing projects. Victoria School Village, located in the downtown area of Kitchener, is a good example of how intensification goals can be achieved in conjunction with other social goals such as the provision of affordable housing, heritage conservation, neighbourhood revitalization, and recreation; all of these are addressed in a comprehensive redevelopment scheme. The project involves the conversion of a large three-storey inner-city elementary school into housing and a 14,000 square foot (1300 m^2) community centre with additional infill housing built on the school grounds.

THE HEALTHY CITY

Perks and Tyler (1991, p. 11) have rightfully pointed out that issues of social equity are not given enough consideration in the economic-environmental debate:

> What will unemployment, affordable housing, food production, health care and social service delivery mean in a brave new sustainable world? The issue of social equity may yet turn out to be the "sleeping giant" of sustainable development for Canadian planners.

Indeed, equity, both intra- and inter-generational, is one of the key principles of sustainable development as formulated by Brundtland and others. As Wismer (1990, p. 6) has noted: "Distributional issues are clearly important in sustainable development, not only across generations, in order to ensure that those to come have equal opportunity with those of us who are here now to live a fulfilling and secure life, but also across the lines of race, class, gender and geography that divide people today."

To a large extent, the healthy city movement addresses this aspect of sustainability through both its goals and processes. The origin of the healthy city movement can be traced to a planning reform movement of the mid nineteenth century. The public health movement campaigned for better public water supplies and sewer systems and for the eradication of slums. According to Hodge (1991, p. 83): "[v]arious arguments were invoked over the years, from the waste of previous lives to the moral decay caused by slum conditions to the economic cost of sickness of industrial workers."

The healthy city movement takes human health as its starting point, and addresses the interrelationships between environmental and social degradation. Health has physical, social and mental implications and its relationship to income, education, access to services, and the urban built form, among other things, sets the agenda for the healthy cities program (Berlin, 1989; Premier's Council on Health, Well-being and Social Justice, 1993). The Canadian Institute of Planners has indicated that Healthy Community Projects are "sustainable development on the ground," a participatory, community-level approach to a "macro-level concept" like sustainable development (CIP, 1990, p. 11). The World Health Organization (WHO) defines a healthy city as "one that is continually . . . creating those physical and social environments which enable its people to mutually support each other in carrying out all the functions of life and achieving their full potential" (in Nozick, 1992, p. 81).

The WHO Healthy Cities Program was announced in 1986, based on a broad interpretation of health, which required the involvement of public agencies and departments not traditionally focused on health (Lane, 1989). Exported from Canada, to Europe, and imported back to Canada, the concept was adopted by the Canadian Public Health Association, the Canadian Institute of Planners (CIP), and the Federation of Canadian Municipalities (FCM). Together, they sponsored the Canadian Healthy Communities Project where "communities" replaced "cities" so as to include municipalities of all sizes (Lane, 1989, p. 5). The project sought to develop "models of good practice," which were aimed at and implemented by municipalities:

> Part of what makes a community healthy is a process whereby municipal government and local citizens are providing leadership to enhance healthy development and reduce inequalities. . . . [it] requires local action in areas such as education, housing, urban

> planning, economic development environmental hygiene, multisectoral action, or healthy public policy (Bailey, 1990, p. 68).

The program is action oriented, and seeks to strengthen local citizens' capacity to achieve change themselves (Pike *et al.*, 1990). There are national, provincial and regional networks in Canada with the purpose of facilitating, supporting and helping to initiate municipally-based projects.

The municipality is considered to be the appropriate level of implementation, given that most of the services that people require—garbage collection, water, sewerage systems, transportation and fire protection, among others—are municipal responsibilities. The current institutional framework, however, lacks the coordination among the various departments—parks, public works, health, purchasing and education—that is needed to implement effective healthy city policies. Added to this challenge is the need for community members to be incorporated into the formal decision-making processes, and for the private sector to be involved in the implementation processes. In this way, resources can be allocated under a co-ordinated policy and developed with the participation of the people affected (Hancock, 1993; Berlin, 1989).

The Ontario Premier's Council on Health, Well-Being and Social Justice outlines a program for healthy community development which follows the Canadian example for intersectoral co-ordination and community involvement (Premier's Council, 1993). Its conception of a healthy community is quite broad:

> A "healthy" community is one in which people live in harmony with their natural and built environments. Healthy communities are planned and developed in a way that preserves the natural environment and cultural heritage, encourages community interaction, provides easy access to a range of services and leisure opportunities, provides efficient and safe traffic flow, and encourages social diversity and respect for a variety of lifestyles (Premier's Council, 1993, p. 41).

While intuitively attractive, the Healthy Community concept has been criticized on a number of grounds. Hendler (1989) raises several questions about the workability of the healthy community concept, including the dubious relevance of broad-based principles; the slow progress in developing appropriate goals, objectives and especially indicators for communities; the important yet often ambivalent role of political will; and ineffective participatory methods. To this list one could add difficulties in attracting and maintaining community involvement (especially sectors such as business and industry); securing adequate resources; remaining true to the participative nature of the healthy community concept; and finding a niche among the myriad other community based groups and exercises at work in most municipalities.

These difficulties notwithstanding, hundreds of communities around the world have declared themselves to be Healthy Communities or Healthy Cities (Ashton, 1993). There is a network of

Healthy Cities in Europe aimed specifically at the WHO objectives of achieving Health For All by the year 2000 (Pike *et al.*, 1990). Communities in the United States are beginning to be active and, as indicated above, there are many networks and projects in Canada at all levels of government.

The structures and activities vary greatly among these networks and the projects thereof. Healthy city or community offices/departments/*etc.* may be autonomously situated units in the municipal government structure; they may be committees or sub-committees of city council; they may be directly associated with the Chief Administrator's Office; or they may be part of a non-governmental organization. It is unclear as to which structure leads to the most effective method of enhancing the sustainability of the municipality.

Activities pursued by projects in Canada have included health audits, kids' surveys, visioning exercises, healthy community resource centres made accessible to the public, state of the city reports, strategies to reduce pollution, community gardens, health impact statements, priority street cleaning and snow removal, and the development or co-ordination of various policies (e.g., restricting vehicle idling, tree planting, establishing non-smoking areas, access to adequate nutrition, *etc.*) (Pike *et al.*, 1990, Ontario Prevention Clearinghouse, 1993a, 1993b; Berlin, 1989; Goldblatt, 1989; Lane, 1989). The development of healthy community indicators is an ongoing effort at international as well as community-based levels.

One of the central contributions of the healthy community movement to sustainable urban development is "process." The health or liveability of a city is based in the participation of its people. This participatory philosophy is evident in the planning processes used to create or encourage healthier environments. These processes are grounded in the broadly based definition of goals (visioning exercises, community surveys, community-based and multisectoral leadership), grassroots implementation of these goals, and evaluation that is concerned as much with process as with substance.

Healthy community processes have been outlined by, for example, the Ministry of Health in the Province of British Columbia. This sort of planning process indicates that a healthy community approach to sustainable urban development requires different skills than are typically considered as being central to the planning profession. Indeed, land-use planning *per se* enters into healthy community thinking tangentially—as only one of several professions that are relevant to the healthy community endeavour. Social planners, public health professionals, health planners, environmental planners, strategic planners, economic planners, transportation planners and others are all involved.

The healthy community is one that is focused on the perspective of the user of the city, community, region or neighbourhood. In this context, the user is the resident—someone who lives and

participates in the workings of their community. A healthy community project strives to capture the imagination of the users and present opportunities for them to become more involved in planning their environments.

CASE STUDY: KINGSTON, ONTARIO

The case of Kingston, Ontario (see, e.g., Ontario Prevention Clearinghouse, 1993c) appears to be fairly typical of the evolution of healthy community projects in Canada. Interest in a local healthy community project began in 1989, when a group of citizens concerned about enhancing the safety of their city realized that issues of safety were not limited to penitentiaries, police departments and public education. Instead, they had to do with poverty, literacy, urban design, self-esteem and encouraging a sense of community on the part of community residents. Upon hearing of the Canadian Healthy Communities Project, this group of individuals decided to attempt a local project. Small pilot projects were carried out, co-ordinated largely through the John Howard Society and the Social Planning Council. Proposed motions before city council in 1990 regarding the participation of the municipality in the Canadian project were passed and the project became official. The original statement of philosophy of the Kingston Healthy Community Project summarizes its approach:

> Our Healthy Community Project shall be meaningfully participative, multisectoral, and focussed on health promotion using the broad World Health Organization definition of health. Our activities shall be based on a consensus-building approach acknowledging individual group agendas. We see ourselves as an integrative, positive and motivating force in the community which is meant to capture the energy and creativity of residents (Committee to Establish a Healthy Community Project in Kingston, 1990).

Since 1990, there have been different iterations of a healthy community project advisory committee. Participants have included the mayor and other city councillors, municipal staff from line departments, representatives from various interest groups, and people representing particular interests (as opposed to organized groups). Projects have included a city hall health audit, a healthy community weekend, the establishment of a healthy community resource centre in the public library, and an evolving set of healthy community indicators. Challenges experienced by the current committee include lack of resources, difficulties in maintaining community interests in process-oriented activities, uneven leadership, and difficulties in promoting the healthy community concept. The lack of visible products, consistent membership and municipal commitment have all contributed to the current state of affairs.

Thus, a healthy community approach to SUD emphasizes the human side of the urban community. It does not guarantee that the three Es of sustainable development—equity, environment,

and economy—will be addressed. Instead, it presumes that diverse and multisectoral groups of people will naturally come to address this sort of agenda. While other methods of sustainable development may deal with particular issues more quickly and efficiently than would a healthy community project, one could argue that the participative nature of the latter would lead to a socially more sustainable outcome. In other words, only if the people are behind a move to enhance urban sustainability will such efforts be truly sustainable.

THE GREEN CITY

The green city concept has its roots in the landscape planning movement, begun in Britain in the early part of the eighteenth century. This movement, initiated by Lancelot Brown, emphasized practical landscape designs that integrated utility and beauty as an alternative to the ornamental designs popular at the time. Other contributors to this tradition include American urban park designer Frederick Law Olmsted, the Scottish biologist and town planner Patrick Geddes, the English garden city advocate Ebenezer Howard, and the work of the International Union for the Conservation of Nature (IUCN).

In the 1960s and '70s, this tradition inspired a generation of urban ecologists who are the direct ancestors of the green city movement. Of these, Ian McHarg was undoubtedly the most influential. In his book, *Design With Nature*, McHarg proposed a way of looking at the urban ecosystem as an integrated whole, with the realization of human potential being dependent on a healthy environment. He wrote:

> Where you find a people who believe that . . . [they] . . . and nature are indivisible, and that survival and health are contingent upon understanding of nature and . . . [its] . . . processes, these societies will be very different from ours, as will be their towns, cities and landscapes (1971, p. 25).

McHarg insisted that urban development be based on a comprehensive understanding of natural features and ecological processes. Above all, he believed that development must not interfere with essential ecological processes and that urban infrastructure should harmonize with natural processes, not replace them. Over the next several years, *Design With Nature* would become a touchstone in the burgeoning literature on urban ecology and planning. For instance, Canadian ecological planner and designer, Robert Dorney, distinguished four types of site planning: flat earth, contour, feature and constraint, and ecosystem, with the last of these being the one that he embraced (Dorney and Rich, 1976). He applied this approach, in varying degrees, to different site designs, including the establishment of an interconnected system of greenways in a Waterloo, Ontario suburb.

Also following in McHarg's footsteps, Newman (1975) wrote that cities and ecosystems are both characterized by the combined efforts of successions of biotic inhabitants to survive under a certain set of environmental constraints. Cities and ecosystems operate under the same restrictions and mechanisms of the fundamental laws of nature—the laws of thermodynamics, of motion, of gaseous diffusion, of the structure of matter and its interactions. Rather than perpetuating an obsolete notion of humanity and its settlements as separate and distinct from the natural world, human communities should be structured along the same lines as ecosystems.

Unlike Newman's macro-ecological analysis applied at the community level, Todd and Todd have designed an ecological approach to be applied at the micro-level of the individual site. Their designs for refitting the built urban environment are aimed at increasing self-sufficiency in an eco-friendly way: water is drawn from the ground for household aquaculture, urban gardening is implemented indoors, on rooftops, on sidewalks and in shared community spaces (Todd and Todd, 1984).

In the green city, municipal infrastructure relies less on engineering systems and instead considers the use of natural processes (such as storm water ponds, or using natural soil and topographic drainage features). The organization of green and built space is such as to provide connectivity between human and natural systems, serving as corridors for both humans and wildlife and connecting the city with the countryside. Native plant species are favoured in urban landscapes to minimize the need for intensive "administration" in the form of water and maintenance requirements. Water quality is improved by restoring the hydrological cycle through the creation of wetlands, recharge areas, and so on. Urban design is used to influence micro-climatic patterns by increasing air quality and reducing the heat-island effect (Spirn, 1980, 1984). "Eco-planning" (Dorney, 1989) identifies critical features such as unique ecosystems, and sites developments to maximize natural drainage, and uses floodplains or wetlands to enhance moisture retention and seasonal groundwater recharge. Built form uses orientation to the sun and wind as well as landscaping to reduce indoor heating and cooling requirements (Akbari and Haider, 1991), rooftop gardens supply food (Overtveld, 1990), while waste processing (e.g., composting) facilities are integrated into design at the site and building levels.

The green city requires the integration of human and natural process in a mutually beneficial relationship: human development activities and technology contribute to the preservation or restoration of ecological systems and, in turn, draw upon those systems for "environmental services" such as water and air purification, nutrient cycling, energy production, food, and so on (Hough, 1990). As Kirkpatrick Sale (1985, pp. 117-18) has put it:

> The spirit of the countryside would need to become absorbed into the veins of the city. Not merely in the sense of parks and woodlands . . . as desirable as they would be. But more: the city would have to be as rooted in the earth, as close to the natural processes, as the farm and the village . . . in short integrating into every urban process a total understanding of ecological principles that is at present so astonishingly lacking.

Green urban policies and design reflect an ecological definition of community, place and home that unites nature and human culture. From this perspective, human settlements develop within the capacities and resources of their own ecosystems, rather than consuming the resources of other communities. Self-sustaining communities based on the natural resources of the area incorporate new forms of transportation, food production, concepts of work, renewable energy sources, waste renewal and the restoration of natural watersheds and wildlife within urban areas. An ecological audit is a useful tool which helps communities see where they stand in relation to ecological efficiency and bioregional self-sufficiency, thus identifying priority issues (Nozick, 1992).

Certainly a feature of Green Cities is the colour green itself. Rather than setting aside areas for parks, the entire urban area is seen as parkland and areas for housing and industry are set aside. Most Green City proposals advocate the conversion of open space and vacant land to urban forests or natural habitat for indigenous plant and animal species. Goode (1990) stresses nature conservation or habitat creation where necessary, and ecological landscaping with a solid foundation in historical ecology.

Multi-modal transportation routes are also a standard feature of green city proposals. Footpaths, cycleways, bus routes or railway stations are often combined with linear parks or green spaces, and provide adequate and accessible transit alternatives to car use. Certainly the success of such a transportation system depends on the land-use pattern, and using vacant urban space with infill housing and activity nodes of all kinds will foster a transit-friendly environment (Johnson, 1984).

Morris argues for a self-reliant green city, which is economically feasible if a full cost accounting system were in place. Local self-reliance is desirable because it increases experimentation and hence diversity, reduces pollution because it improves efficiency, and reduces the resources required to maintain a large-scale system (Morris, 1990).

CASE STUDY: SAN FRANCISCO

The Green City Program initiated by Peter Berg of the Planet Drum Foundation in San Francisco is an instructive example of the green city movement (Berg *et al.*, 1989). The planning unit is defined as the bioregion, encompassing a vast amount of ecological and cultural diversity. The population of the region is expected to increase by 650,000 by the year 2000, and the Green City Program is intended to accommodate that growth without damaging the "health of local systems upon which any sensible notion of sustainability must ultimately depend" (Berg, 1990, p. xi). This entails a fundamental shift in the premises of urban living: replacing consumer values with conserver values, short-term gain with long-term sustainability, and the production of necessities within cities instead of the consumption of resources from other regions.

A series of Green City meetings was held in 1986 to bring individuals and groups together to discuss the facets of the problem. *A Green City Program for San Francisco Bay Area Cities and Towns* is a full account of the meetings and proposals. Taken as a whole, the Green City Program is about community self-reliance. It identifies the current conditions and desired goals concerning several key issues, and then provides proposals for urban planting and wildlife habitat, transportation, energy, neighbourhood character and empowerment, recycling and reuse, and socially responsible small businesses and co-operatives that will further the goal of community self-reliance. The proposals, like most Green City projects, have immediate and short-term results as well as lasting impacts and are inexpensive to implement.

While these proposals have not achieved the status of municipal policy, they provide a common framework for those who are working toward a green city future. Some initiatives that are underway in the San Francisco Bay Area in both the private and public sectors are as follows:

- Residents donated private backyard garden space in order to provide food for a soup kitchen in the Haight-Ashbury neighbourhood. Homeless volunteers do the gardening, finding useful work and self-respect.
- A cement backyard was converted into a "vest-pocket" playground by the San Francisco Conservation Corps (an employer program for 18-23 year old youth at risk) in a neighbourhood which has many families but few safe play areas for children.
- San Francisco's 1986 Master Plan indicated a commitment to maintaining and restoring native vegetation in open spaces. Since then, eight volunteer organizations have begun projects in ten different locations to restore damaged habitat.
- A Community Thrift Store was launched by the Tavern Owners' Guild of San Francisco. Non-profit organizations can direct donations of used goods to the store where the goods are

assigned an identification number. At the end of each quarter, each non-profit organization is sent a donation that reflects the sales carrying its identification number.

- Energy conservation retrofit ordinances require all existing buildings to be brought up to an energy conservation standard at the time of sale.

POTENTIAL FOR CONVERGENCE AND CONTRADICTION

This concludes our descriptions of the three strands that, together, make up the tapestry called sustainable urban development. To this point, we have reviewed the literature on planning and SUD by studying three planning-related movements, each emphasizing a different dimension of sustainability: the Compact City, the Healthy City and the Green City. Each of the three perspectives outlined here is essential in achieving sustainable urban development: the compact city promotes the economic and fiscal health of the community and reduces the environmental stress caused by the city's metabolism; the healthy city creates the human environment, which is a condition of a more compact city form and emphasises environmental quality from a user perspective; while the green city integrates the human and spatial aspects with ecological processes.

In introducing this report, we claimed that one of the advantages of this approach is that it does not assume an abstract unity among the various strands of SUD. By way of conclusion, then, we reprise the movements and look at the potential for convergence *and* contradiction among these three movements. In this regard, and for ease of analysis, we structure our discussion in terms of alternate pairings of the three perspectives, as follows.

COMPACT AND HEALTHY CITIES

The compact city is clearly an incomplete vision of sustainable urban development. First, it does not fully take into account the important relationship between the human "user" and the natural environment. In fact, the interaction of the built and human environment is dialectical—the built environment contributes to the liveability and desirability of a place, which in turn reinforces the conditions for a more ecologically sustainable built environment. Drawing on Jane Jacobs, Paehlke (1989) for instance, has pointed out that the vision of higher density living involves significant alterations of lifestyle, with a considerable potential for resistance. A more compact city can only be achieved by attracting new residents to the city core and reducing the resistance of existing residents throughout the city to higher density living. This can not be achieved if compact form means air pollution, crowding, traffic congestion and crime. Therefore, a compact city must be a liveable city, a theme that is well-addressed by the healthy city movement. As we saw, the healthy city movement

promotes green spaces for recreational use, the increased comfort of pedestrian movement, and an overall sense of place or local identity. The healthy city enhances the quality of the environment from a human user point of view—"clean air, soil and water, and a variety of species and habitats" (OGTA, 1992, p. 8).

Thus, the shortcomings of the compact city may be addressed by the strengths of the healthy city. The converse may also be true. It has been pointed out for instance, that:

> the Healthy Community idea has its limits, limits that are addressed well by [the compact city]. For example, a Healthy Community project in a wealthy suburban neighbourhood would be of some benefit, but those benefits would accrue to people who are already healthy and employed. Moreover, the project would fail to confront the critical issue for urban form itself: that auto-mobile dependent suburbs do not appear to be sustainable at all (CIP, 1990, p. 11).

On this basis, the CIP urges its members to embrace both concepts, "working to ensure they are complementary, not competitive."

More specifically, while the goals of the two movements are substantially different, there is evidence that they are—to some degree—mutually supportive. For instance, some authors have argued that the deconcentration of cities has destroyed public places and the conditions for full participation in democratic institutions (Fowler, 1992). More compact cities with mixed neighbourhoods may be more politically vibrant and inclusive, consistent with the goal of the healthy cities movement, which emphasizes democratic participation among all sectors of society. Coming full circle on this argument, it has also been pointed out that, given the disruptions that may be associated with measures to achieve more compact cities, "[d]emocratic mobilization is essential to the achievement of such policies in the face of the opposition [by vested interests they] inevitably engender"(Paehlke and Torgenson, 1990, in Rees and Roseland, 1991, p. 20).

Some observers have argued that the compact city and the healthy city are also compatible from an equity point of view. For example, low-density suburban development favours those who can afford a car; those without a car find that they are relatively immobile. Thus more compact development may be a condition for more equitable access to public and private services, a healthy city goal (Premier's Council, 1993).

Also along these lines, Rees and Roseland (1991, p. 20) have pointed out that:

> . . . more efficient landuse and tax policies to discourage land speculation will increase the affordability of housing in the city and enable people to live closer to work. Shifting some of the public subsidy from automobile use to improved public transit will improve access to the city for lower income groups while attracting riders from all social strata.

Still, it is common perception that the movement for efficient, compact cities pays little attention to the issue of social equity. This is so even though policies designed to achieve a more compact city form have significant equity implications.

- A more densely settled city may compromise the quality of life in certain important respects: "Of course adding density to built-up areas of the city means bringing change to its existing neighbourhoods. In most cases this doesn't meet the wishes of residents who value the quality of life afforded by living at lower densities: fewer people, less traffic, and more open space" (Burch, 1992, p. 2).
- The compact city movement tends to favour planning on a regional scale. But the centralization of decision-making that this implies may conflict with the community's desire to be more self-reliant and involved on a grass-roots level in decisions that affect them (Morrill, 1991).
- Policies designed to inhibit sprawl affect different people differently. A development freeze on the urban fringe may increase housing prices in certain areas of the city. This may be good for existing residents, but bad for newcomers to the area such as younger families and households looking for affordable housing. The environmental benefits of a compact city policy (such as the preservation of ravine systems in certain neighbourhoods) may not be equally shared, or the costs of the policy (say, the loss of construction jobs) may fall more heavily on one sector of society than others (van Vliet, 1991).
- Some compact city policies may result in regressive social policy. For instance, impact fees are commonly levied on new developments in order to discourage discontinuous (leapfrog) development and to help finance environmental services. Most forms of such fees unfairly tax poorer home owners. Fees based on the unit value of the housing being constructed are regressive because poor people spend larger proportion of their income on housing than the rich (Nicholas, 1992).
- Compact city policies may also force low-income households to leapfrog over preserved open space to less expensive communities in the surrounding region. "Not only were they thus denied the opportunity to share in the preferred quality of life, but commuting between their new residence and old place of work produced traffic congestion and air pollution threatening the very quality of life at which the control measures were aimed in the first place" (van Vliet, 1991, pp. 53-54).
- Promoting the compact city may violate the average urban resident's conception of urban liveability. Many studies have shown that most consumers prefer low-density single-family

detached housing (e.g., Michelson, 1984, 1985). Among the many perceived advantages of such housing are a pleasant environment for raising a family, privacy (Lansing, 1967, 1970), and a rural ambience (Fuguitt, 1975, 1989).

- A compact urban form may be promoted by powerful agencies for reasons that have little interest in social equity or liveability. The demographic structure of our communities is changing in such a way as to create a market for smaller housing units closer to transit facilities than the typical suburban bungalow (Cooper, 1986; Booth, 1985). According to Hardy (1990, p. 16), "[f]rom the perspective of the development industry, expensive, land consumptive homes are now difficult to sell. Builders catering to the move-up market with 50 and 60 foot [15-18 metre] lots and estate residential housing have found themselves hit by the slump in home sales. As a result, many are moving to smaller, more compact developments." Thus, the alliance between compact and healthy cities could be partially based on an ephemeral market phenomenon.

COMPACT AND GREEN CITIES

A compact city uses space more efficiently and therefore has the potential for taking into account the locational aspects of natural features—it may leave environmentally sensitive and hazard areas undeveloped and protect environmental resources, such as woodlots, farmland and aggregates. We have seen that a compact urban form is supposed to reduce the need for automobiles, which lowers the production of greenhouse gases and other air pollutants, and encourages public and self-propelled forms of transport (bicycle and walking). A compact city may also reduce heating costs, allow ground water recharge and reduce run-off, and absorb less farm land. It is also said that a compact urban form will make the provision of environmental services (water and sewerage, garbage collection, recycling programs, incinerators, and so on) more efficient and therefore more affordable and widespread (Paehlke, 1991).

All of these claims imply that achieving compact cities will go a long way towards achieving green cities. The converse may also be true. The ecologically sensitive design of infrastructure, site, and individual buildings would allow the compact city to achieve further efficiencies in the use of energy, land and materials, and would help avoid the need for costly environmental restoration. The urban metabolism would "switch" from expensive fossil fuels, imported food and materials, to one which is more reliant on local resources and the "free" services provided by nature (Giradet, 1990).

Thus, the compact city has significant environmental benefits that inure it to the supporters of the green city movement. On the other hand, arguments have been put forward that cast doubt

on the compatibility between the compact and the green cities. Compact cities may reduce the amount of green space (Audirac, 1990), may lead to greater traffic congestion and poorer air quality (Naroff and Ostro, 1982), and may inhibit the widespread introduction of energy facilities based on renewable resources such as solar and wind power (Ward, 1990).

Indeed, the spatially efficient city is perfectly compatible with the traditional practice of replacing environmental functions with engineered technology and disengaging human and natural systems in order to overcome the limitations of resources and carrying capacity. Spatially efficient site designs may ignore or damage topography, soils and hydrological features. For instance, neotraditional design which emphasizes a return to a grid street pattern in order to decrease congestion and increase liveability, has tended to ignore topographic features and ecological functions (Okomato, 1991). The compact city may respect the location of environmentally sensitive areas but it is not grounded in a respect for essential ecological processes.

GREEN AND HEALTHY CITIES

The green city and healthy city movements converge in both their goals and processes. As has been pointed out above, the healthy city movement promotes more liveable environments from a city user perspective: clean air and water and open spaces. Conversely, many of those involved in the green city movement have begun to recognize the need for establishing social as well as ecological goals. For instance, a planning report on the ecosystem approach to urban design in the Ottawa-Carleton region (Miller, n.d., p. 4), recommended that such an approach:

> Provide for processes and interactions necessary for individuals to lead productive, meaningful lives:
> - provide healthy living environments
> - provide opportunities to meet goals and aspirations
> - increase self-reliance and self-sufficiency and the control over daily lives.

Similarly, in her discussion paper on ecological planning, Barrett (1991, p. A8) clearly recognized the need for social goals: "The goals should define needs to be met and problems to be solved and could be developed using concepts such as healthy cities."

In terms of process, both movements involve professional groups but have a strong citizen-based element. We have already seen how the healthy city approach promotes widespread participation in planning and policy processes. Conversely, the ecosystem approach relies fundamentally on involving the widest range of stakeholders in the planning process. Stakeholders are valued in a number of ways: some are amateur experts on ecosystem processes, others are influential

within their communities and can help build support for implementing green city goals, others may control resources, such as property, whose disposal may be essential to the realization of a green city.

For instance, in *Regeneration*, the Crombie Commission identifies "involvement" as a key aspect of the green city:

> . . . ecosystem planning involves all key stakeholders working together in an open, public, fair, and efficient process. Relationships have to be worked out among many interests—the public, different levels and agencies of government, the private sector, special-interest groups, and others. . . . This should result in more timely and efficient decision-making, with fewer antagonistic procedures than often occur in traditional planning and environmental assessment processes (Royal Commission on the Future of the Toronto Waterfront, 1992, p. 81).

The difference between the ecological perspective of the green city and the human user perspective of the healthy city has the potential to bring these movements into conflict. Urban design may aim to increase sun and reduce wind on the street in the name of liveability, but ignore ecological design characteristics such as the choice of building materials, gray water cycling, composting, and so on (Okomato, 1991). The healthy city may prescribe a "bonsai wilderness",[3] but ignore basic ecological processes.

At a more fundamental level, the basic orientations of the two movements may be at odds. A green city takes ecological principles as its starting point and defines both human behaviour and urban form as a result. The healthy city, on the other hand, emphasizes the creation of community along the lines envisioned by its inhabitants, which in no way assures ecological stability. The green city movement proposes a much richer integration between human and natural process than does the healthy city movement. The difference between the two movements may be summed up in the distinction between house and home found in this analogy:

> The primary distinction between environmental and 'ecosystem' approaches depends on whether the system under consideration is external to (in the environmental approach) or contains (in the 'ecosystem' approach) the population under study. The conventional concept of environment is like that of *house*—external and detached; in contrast, 'ecosystem' implies *home*—something that we feel part of and see ourselves in—even when not there . . . The shift from an environmental to an 'ecosystemic' point of view is actually quite radical. It calls for a change in the entire field within which opportunities and problems are examined—a change from a view of environment in a political or people-oriented context to a view of politics in an 'ecosystem' context (Vallentyne and Beeton, 1988, p. 58).

Or, as one observer put it: "the emphasis on human health makes the [healthy communities] project appealing to an anthropocentric society; unfortunately, the application of the concept in some communities may relegate ecological sustainability to a secondary concern" (Bailey, 1990, p. 68).

CONCLUSION

Our analysis indicates that sustainable urban development is a complex, multi-faceted array of complementary and contradictory philosophies and corresponding strategies. The former includes environmentalist (Green), humanist (Healthy), and mechanistic (Compact) perspectives. The latter includes a variety of planning activities from SUD considerations being incorporated into official plans, environmental reporting and budgetary deliberations, to citizen-based healthy community projects and round tables (see also Tomalty and Hendler, 1991).

While the spectrum of planning instruments and methods potentially leading to sustainable urban development is broad, the choices available to municipal decision makers may be limited. There is little in the way of evaluation of the success of SUD measures, and most are costly in terms of finances, staff time, changes in value orientations and political conflict. Thus, despite the fact that all levels of government have staked a claim in enhancing the sustainability of our environments, there is little to guide municipalities in terms of concerted action and direction (see, e.g., O'Grady, 1993). This, in conjunction with planners being slow fully to embrace the notion of sustainability in their work, has largely relegated the ever-burgeoning SUD literature to the shelf instead of the planning committee meeting.

Whether SUD moves beyond the realm of imagery to on-the-ground reality thus remains to be seen. Having said this, however, as planners continue to search for relevance in their work (Richardson, 1988), sustainable urban development represents a slogan or, better still, a vision for their profession, their employers and the publics who work with them to create urban environments. Certainly, as this review has shown, there is no shortage of information, research and options available to the planner who envisions a sustainable future for her or his municipality.

NOTES

1. This is not meant to minimize the contribution of non-professional citizens. To some extent, professional groups are merely riding a wave of concern about the environment among the general public.

2. Examples include: Fowler (1991), Pianosi (1991), Fulford (1993), the Ontario Round Table (1991), Alberta's Environment Council (1988), D'Amour (1991, 1993).

3. According to Raglon (1991), the bonsai wilderness is the decorative green spaces of the garden city. This approach to nature is common in the literature on healthy cities (e.g., Crowhurst, 1987).

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